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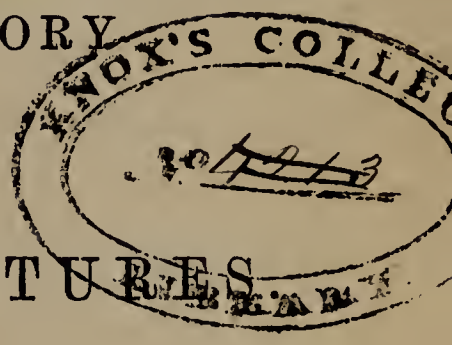
Knox College

ARCHAIA.

ARCHAIA;

OR,

STUDIES OF THE COSMOGONY AND NATURAL HISTORY OF THE HEBREW SCRIPTURES.



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"The two sciences (Theology and Geology) may conspire, not by having any part in common, but because, though widely diverse in their lines, both point to a mysterious and invisible origin of the world."—WHEWELL.

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TO

His Excellency the Right Hon. Sir Edmund Walker Head, Bart.,

GOVERNOR GENERAL OF BRITISH NORTH AMERICA, ETC.

AS A PATRON OF CANADIAN SCIENCE AND LITERATURE, WHO GRACES THE HIGHEST POSITION IN BRITISH AMERICA BY HIS PERSONAL QUALITIES AS A STATESMAN, A SCHOLAR, AND A MAN OF SCIENCE,

This work is dedicated,

IN TESTIMONY OF THE MOST SINCERE RESPECT, AND OF GRATITUDE FOR PERSONAL KINDNESS,

By the Author.

PREFACE.

THIS work is not intended as a treatise on elementary Geology, with Theological applications, nor as an attempt to establish a scheme of reconciliation between Geology and the Bible. It is the result of a series of exegetical studies of the first chapter of Genesis, in connection with the numerous incidental references to nature and creation in other parts of the Holy Scriptures. These studies were undertaken primarily for the private information of the author; and are now published as affording the best answer which he can give to the numerous questions on this subject addressed to him in his capacity of a teacher of Geology. A farther use to be served by such a work, even after all the numerous treatises already published, is that of affording to geologists and the readers of geological works, a digest of the cosmical doctrines to be found in the Hebrew Scriptures, when treated strictly according to the methods of interpretation proper to such documents,

but with the actual state of geological science full in view. On the other hand, biblical students and christians generally, may be interested in noting the aspects in which the scriptural cosmogony presents itself to a working naturalist, regarding it from the stand-point afforded by the mass of facts and principles accumulated by modern science.

The author has availed himself of all the critical and expository helps within his reach; but has carefully avoided that parade of contradictory authorities, which, by an easy but useless show of erudition, often swells such works to unnecessary dimensions. He has trusted principally to a careful comparison, in the original, of all the scriptural references to every fact and term in question. This process, though tedious, has proved capable of yielding answers to many doubtful questions, more positive and satisfactory than those which could be obtained in any other way. He does not, however, pretend to have exhausted the subject; and is quite aware that, in an investigation connected with so many widely different branches of knowledge, he may have to crave the indulgence of the reader for many errors and omissions.

The author must further express his conviction, that a fitting audience for such topics can be found only among those who are imbued with a knowledge of natural science,

acquired by its own peculiar methods of investigation, and who also entertain, on its special and very different evidence, a firm faith in the inestimable spiritual revelations of the Word of God. However highly he may respect and love naturalists who have given no attention to the claims of scriptural christianity, or theologians who know nothing of nature, he does not expect from either a full appreciation of his views. Still less can he hope for the approval of that shallow school which decries "Bible philosophy" as a thing of a by-gone time, and attempts to raise an insurmountable barrier between the domains of faith and reason, by excluding from nature the idea of creative power, or from religion the noble cosmogony of the Bible. His utmost hopes will be realized, if he can secure the approbation of those higher minds in which the love of God is united with the study of his works; and aid in some small degree in redeeming the subject from the narrow views which are, unhappily, too prevalent.

The work is issued in Canada, because the writer desires to contribute his mite to the growing literature of British America, and has found in Montreal a house sufficiently enterprising to undertake the risk of publication.

J. W. D.

McGill College,

Montreal, November, 1859.

CONTENTS.

CHAPTER I.—Introductory,..... 9

II.—Objects, Character and Authority of the Hebrew Cosmogony,..... 17

III.—General Views of Nature contained in the Hebrew Scriptures,..... 49

IV.—The Beginning,..... 61

V.—The Desolate Void,..... 71

VI.—Light,..... 86

VII.—Days of Creation,..... 98

VIII.—The Atmosphere,..... 130

IX.—The Dry Land,..... 147

X.—The First Vegetation,..... 160

XI.—Luminaries,..... 175

XII.—The Lower Animals,..... 187

XIII.—The Higher Animals,..... 206

XIV.—Man,..... 214

XV.—The Rest of the Creator,..... 232

XVI.—Unity and Antiquity of Man,..... 246

XVII.—Comparisons and Conclusions,..... 316

CONTENTS.

APPENDIX A.—Authenticity and Genuineness of the Mosaic Books, ... 361

B.—Relation of the Human and Tertiary Periods, ... 363

C.—Original Fluidity of the Earth,..... 365

D.—Azoic Rocks,..... 367

E.—Ancient Floras, ... 369

F.—Development of Specific Forms by Natural Law,..... 370

G.—The Tanninim,..... 388

H.—Recent Elevation of Western and Central Asia, and Specific Centres of Creation, ... 390

I.—Primitive Unity of Language,..... 391

K.—Ancient Mythologies, ... 394

L.—Supposed Tertiary Races of Men, ... 397

ARCHAIA.

CHAPTER I.

INTRODUCTORY.

More than thirty centuries ago, a numerous serf-population emancipated itself from Egyptian bondage, and, after forty years of wandering desert life, settled itself permanently on the hills and in the valleys of Palestine. The voice of the ruling race, indistinctly conveyed to us from that distant antiquity, maintains that the fugitive slaves were an abject and contemptible herd; but the leader of the exodus informs us, that, though cruelly trodden down by a haughty despot, they were of noble parentage, the heirs of high hopes and promises. Their migration is certainly the most remarkable national movement in the world's history,—remarkable, not merely in its events and immediate circumstances, but in its remote political, literary, and moral results. The rulers of Egypt, polished, enlightened, and practical men, were yet the devotees of a complicated system of hero and relic worship, vitiating and

degrading all their higher aims. The slaves, leaving all this behind them, rose in their religious opinions to a pure and spiritual monotheism; and their leader presented to them a law unequalled up to our time in its union of justice, patriotism, and benevolence, and established among them, for the first time in the world's history, a free constitutional republic. Nor is this all; unexampled though such results are elsewhere, in the case of serfs suddenly emancipated. The Hebrew law-giver has interwoven his institutions in a grand historical composition, including a cosmogony, a detailed account of the affiliation and ethnological relations of the races of men, and a narrative of the fortunes of his own people; intimating not only that they were a favoured and chosen race, but that of them was to arise a great deliverer who would bless all nations with pardon and with peace.

The lawgiver passed to his rest. His laws and literature, surviving through many vicissitudes, produced in each succeeding age a new harvest of poetry and history, leavened with their own spirit. In the meantime the learning and the superstition of Egypt faded from the eyes of men. The splendid political and military organisations of Assyria, Babylon, Persia, and Macedon, arose and crumbled into dust. The wonderful literature of Greece blazed forth and expired. That of Rome, a reflex and copy of the former, had reached its culminating point. The world, with all its national liberties crushed out, its religion and its philosophy corrupted and enfeebled to the last degree by an

endless succession of borrowings and intermixtures, lay prostrate under the iron heel of Rome. Then appeared among the now obscure remnant of Israel, one who announced himself as the Prophet like unto Moses, promised of old; but a prophet whose mission it was to redeem not Israel only, but the world. Adopting the whole of the sacred literature of the Hebrews, and proving his mission by its words, he sent forth a few plain men to write its closing books, and to plant it on the ruins of all the time-honoured beliefs of the nations,—beliefs supported by a splendid and highly organised priestly system and by despotic power, and gilded by all the highest efforts of poetry and art.

The story is a very familiar one; but it is marvellous beyond all others. Nor is the modern history of the Bible less wonderful. Exhumed from the rubbish of the middle ages, it has entered on a new career of victory. It has stimulated the mind of modern Europe to all its highest efforts; and has been the charter of its civil and religious liberties. Its wondrous revelation of all that man most desires to know, in the past, in the present, and in his future destinies, has gone home to the hearts of men in all ranks of society and in all countries. In many great nations it is the only rule of religious faith. In every civilized country it is the basis of all that is most valuable in religion. Where it has been withheld from the people, civilization in its higher aspects has languished, and superstition, infidelity, and tyranny have held their ground. Where it

has been a household book, liberty has taken root, and the higher nature of man has been developed to the full. Driven from many other countries by tyrannical interference with liberty of thought and discussion, or by a short-sighted ecclesiasticism, it has taken up its special abode with the greatest commercial nation of our time; and scattered by its agency broadcast over the world, it is read by every nation under heaven in its own tongue, and is slowly but surely preparing the way for wider and greater changes than any that have heretofore resulted from its influence. Explain it as we may, the Bible is a great literary miracle; and no amount of inspiration or authority that can be claimed for it, is more strange or incredible than the actual history of the book.

Yet there are in the world many influences directly antagonistic to the Bible, and many others that tend to its neglect, or to an under-estimate of its value. Tyranny hates it, because the Bible so strongly maintains the individual value and rights of man as man. The spirit of caste dislikes it for the same reason. Anarchical license, on the other hand, finds nothing but discouragement in it. Priestcraft gnashes its teeth at it, as the very embodiment of private judgment in religion, and because it so scornfully ignores human authority in matters of conscience, and human intervention between man and his Maker. Scepticism sneers at it, because it requires faith and humility, and threatens ruin to the unbeliever. It launches its thunders against every form of violence, or fraud, or allurement,

that seeks to profit by wrong or to pander to the vices of mankind; all these consequently are its foes. These are terrible opponents; but their hostility was to have been anticipated, and the book has often met and conquered them in the time past. Another class of influences of much more respectable character, are sometimes in our day brought into opposition to the Bible, or perhaps I should rather say into competition with it. The immense mass of modern literature has some effect in casting the Bible into the shade, and in making it less *the* book of the people. It is true that this literature in all its higher forms derives in great part its tone from the Holy Scriptures, yet it buries the book itself. Again, the Bible commits itself to certain facts in history, and there has been much earnest battling on its truth and authority in this respect. At one time it was not unusual to impugn its historical accuracy on the evidence of the Greek historians; and on many points scarcely any corroborative evidence could be cited in favour of the Hebrew writers. In our own time much of this difficulty has been removed, and an immense amount of learned research has been reduced to waste paper, by the circumstance that the stones of Memphis and Nineveh have literally risen up to bear testimony in favour of the Bible; and scarcely any sane man now doubts the value of the Hebrew history. The battle-ground has in consequence been shifted farther back, to points concerning the affiliation of the races of men, and the absolute antiquity of man's residence on the earth; questions on which we can scarcely

expect to find much monumental or scientific evidence. Lastly, the Bible commits itself to certain cosmological doctrines and statements, respecting the system of nature and details of that system, more or less approaching to the domain which geology occupies in its investigations of the past history of the earth; and at every stage in the progress of modern science, independently of the mischief done by smatterers and sceptics, earnest bigotry on the one hand, and earnest scientific enthusiasm on the other, have come into collision. One stumbling-block after another has, it is true, been removed to the satisfaction of all parties; but the field of conflict has thereby apparently only changed; and we still have some christians in consequence regarding the revelations of natural science with suspicion, and some scientific men cherishing a sullen resentment against what they regard as an intolerant inter-meddling of theology with the domain of legitimate investigation.

There can be no question that the whole subject is at the present moment in a more satisfactory state than ever previously; that much has been done for the solution of difficulties; that theologians admit the great service which in many cases science has rendered to the interpretation of the Bible, and that naturalists feel themselves free from undue trammels. Above all, there is a very general disposition to admit the distinctness and independence of the fields of revelation and natural science, the possibility of their arriving at some of the same truths, though in very different ways, and the folly of expecting them fully

and manifestly to agree, in the present state of our information. The literature of this kind of natural history has also become very extensive, and there are few persons who do not at least know that there are methods of reconciling the cosmogony of Moses with that obtained from the study of nature. For this very reason the time is favourable for an unprejudiced discussion of the questions involved; and for presenting on the one hand to naturalists a summary of what the Bible does actually teach respecting the early history of the earth and man, and on the other to those whose studies lie in the book which they regard as the word of God, rather than in the material universe which they regard as his work, a view of the points in which the teaching of the Bible comes into contact with natural science, at its present stage of progress. These are the ends which I propose to myself in the following pages, and which I shall endeavour to pursue in a spirit of fair and truthful investigation; paying regard on the one hand to the claims and influence of the venerable Book of God, and on the other to the rights and legitimate results of modern scientific inquiry.

The plan which I have sketched out for the treatment of the subject, corresponds with the title of the work, and befits the present state of our knowledge, whether of nature or revelation. I have adopted the method not of a teacher but an enquirer, endeavouring in the outset to settle certain preliminary points essential to the right understanding of the subject, and then to sift carefully the scriptural cosmo-

gony, as it appears not only in Genesis but in every other book of the Bible, with reference to its true cosmical import, and apparent agreement or discordance with modern interpretations of nature arrived at by the very different methods of inductive science. If in pursuing this investigation I have proceeded more boldly and unreservedly than has been customary, I plead the desire to discover truth rather than to follow in old paths; and if the results reached should appear strange or startling to the reader, whether scientific, theological, or neither of these, he is asked to bear in mind that there *may* be truths which have not fallen within the range of his previous studies, and to weigh carefully the evidence, even though this also should be foreign to his usual methods of inquiry.

CHAPTER II.

OBJECTS, CHARACTER AND AUTHORITY OF THE SCRIPTURAL VIEWS OF THE COSMOS.

"There are two books from which I collect my divinity; besides that written one of God, another of his servant nature —that universal and public manuscript that lies expansed unto the eyes of all."—*Sir T. Browne.*

THERE are some questions, simple enough in themselves, respecting the general character and object of the references to nature and creation in the scriptures, which yet are so variously and vaguely answered, that they deserve some consideration, before entering on the detailed study of the subject. These are—(1). The object of the introduction of such subjects into the Hebrew sacred books. (2). The character and structure of the narrative of creation and other cosmological statements, in a literary point of view. (3). The degree of authority to be attached to such statements, on the supposition that the Bible is theologically truthful.

(1). *The object of the introduction of cosmogony and references to nature in the Bible.* Man as a "religious animal" desires to live not merely in the present, but in the future also and the past. This is a psychological peculiarity which, as much as any other, marks his separation from the lower animals, and which in his utmost

degradation he never wholly loses. No people is so rude as to be destitute of some hopes or fears in reference to the future—some traditions as to the distant past. Every religious system that has had any influence over the human mind has included such ideas. Nor are we to regard this as an accident. It depends on fixed principles in the human constitution, which crave as their proper aliment such information; and if it cannot be obtained, the mind, rather than want it, invents for itself. We might infer from this very circumstance, that a true religion, emanating from the Creator, would supply this craving; and might content ourselves with affirming that, on this ground alone, it behoved revelation to have a cosmogony.

But the religion of the Hebrews especially required to be explicit as to the origin of the earth and all things therein. Its peculiar dogma is that of one only God, the Creator, requiring the sole homage of his creatures. The heathen for the most part acknowledged in some form a supreme god, but they also gave divine honours to subordinate gods, to deceased ancestors and heroes, and to natural phenomena, in such a manner as practically to obscure their ideas of the Creator, or altogether to set aside his worship. The influence of such idolatry was the chief antagonism which the Hebrew monotheism had to encounter; and we learn from the history of the nation how often the worshippers of Jehovah were led astray by its allurements. To guard against this danger, it was absolutely necessary that no place should be left for the introduction of polytheism,

by placing the whole work of creation and providence under the sole jurisdiction of the One God. Moses consequently takes strong ground on these points. He first insists on the creation of all things by the fiat of the Supreme. Next he specifies the elaboration and arrangement of all the powers of inanimate nature, and the introduction of every form of organic existence, as the work of the same First Cause. Lastly, he insists on the creation of a primal human pair, and on the descent from them of all the branches of the human race, including of course those ancestors and magnates who up to his time had been honoured with apotheosis; and on the same principle he explains the golden age of Eden, the fall, the cherubic emblems, the deluge, and other facts in human history interwoven by the heathen with their idolatries. He thus grasps the whole material of ancient idolatry, reduces it within the compass of monotheism, and shows its relation to the one true primitive religion, which was that not only of the Hebrews but of right that of the whole world, whose prevailing polytheism consisted in perversions of its truth or unity. For such reasons the early chapters of Genesis are so far from being of the character of digressions from the scope and intention of the book, that they form a substratum of doctrine absolutely essential to the Hebrew faith, and equally so to its development in Christianity.

The references to nature in the Bible, however, and especially in its poetical books, far exceed the absolute requirements of the reasons above stated; and this leads to

another and very interesting view, namely, the tendency of monotheism to the development of truthful and exalted ideas of nature. The Hebrew theology allowed no attempt at visible representations of the Creator or of his works for purposes of worship. It thus to a great extent prevented that connection of imitative art with religion which flourished in heathen antiquity, and has been introduced into certain forms of christianity. But it cultivated the higher arts of poetry and song, and taught them to draw their inspiration from nature as the only visible revelation of Deity. Hence the growth of a healthy "physico-theology," excluding all idolatry of natural phenomena, but inviting to their examination as manifestations of God, and leading to conceptions of the unity of plan in the cosmos, of which polytheism, even in its highest literary efforts, was quite incapable. In the same manner the Bible has always proved itself an active stimulant of natural science, connecting such studies, as it does, with our higher religious sentiments; while polytheism and materialism have acted as repressive influences, the one because it obscures the unity of nature, the other because, in robbing it of its presiding Divinity, it gives a cold and repulsive, corpse-like aspect, chilling to the imagination, and incapable of attracting the general mind.

Naturalists should not forget their obligations to the Bible in this respect, and should on this very ground prefer its teachings to those of modern pantheism and positivism, and still more to those of mere priestly authority.

Very few minds are content with simple materialism, and those who must have a God, if they do not recognise the Jehovah of the Hebrew scriptures as the Creator and Supreme Ruler of the universe, are too likely to seek for him in the dimness of human authority and tradition, or of pantheistic philosophy; both of them more akin to ancient heathenism than to modern civilization, and in their ultimate tendencies, if not in their immediate consequences, quite as hostile to progress in science as to evangelical christianity.

Every student of human nature is aware of the influence in favour of the appreciation of natural beauty and sublimity, which the Bible impresses on those who are deeply imbued with its teaching; even where that same teaching has induced what may be regarded as a puritanical dislike of imitative art, at least in its religious aspects. On the other hand naturalists cannot refuse to acknowledge the surpassing majesty of the views of nature presented in the Bible. No one has expressed this better than Humboldt: —"It is characteristic of the poetry of the Hebrews that, as a reflex of monotheism, it always embraces the universe in its unity, comprising both terrestrial life and the luminous realms of space; it dwells but rarely on the individuality of phenomena, preferring the contemplation of great masses. The Hebrew poet does not depict nature as a self-dependent object, glorious in its individual beauty, but always as in relation or subjection to a higher spiritual power. Nature is to him a work of creation and order—

the living expression of the omnipresence of the Divinity in the visible world." In reference to the 104th psalm, which may be viewed as a poetical version of the narrative of creation in Genesis, the same great writer remarks:—"We are astonished to find in a lyrical poem of such a limited compass, the whole universe—the heavens and the earth—sketched with a few bold touches. The calm and toilsome life of man, from the rising of the sun to the setting of the same when his daily work is done, is here contrasted with the moving life of the elements of nature. This contrast and generalization in the conception of the mutual action of natural phenomena, and the retrospection of an omnipresent invisible Power, which can renew the earth or crumble it to dust, constitute a solemn and exalted rather than a gentle form of poetic creation."*

If we admit the source of inspiration claimed by the Hebrew poets, we shall not be surprised that they should thus write of nature. We shall only lament that so many pious and learned interpreters of scripture have been too little acquainted with nature to appreciate the natural history of the book of God, or adequately to illustrate it to those who depend on their teaching; and that so many naturalists have contented themselves with wondering at the large general views of the Hebrew poets, without considering that they are based on a revelation of the nature and order of the creative work which supplied to the Hebrew mind the place of those geological wonders which have

* Cosmos, "Otté's translation."

astonished and enlarged in the minds of modern nations. A living divine, himself well read in nature, truly says:—"If men of piety were also men of science, and if men of science were to read the scriptures, there would be more faith on the earth and also more philosophy."* In a similar strain, the patient botanist of the marine algæ thus pleads for the joint claims of the Bible and nature:—"Unfortunately it happens that in the educational course prescribed to our divines, natural history has no place, for which reason many are ignorant of the important bearings which the book of nature has on the book of revelation. They do not consider, apparently, that both are from God—both are his faithful witnesses to mankind. And if this be so, is it reasonable to suppose that either, without the other, can be fully understood? It is only necessary to glance at the absurd commentaries in reference to natural objects which are to be found in too many annotations of the Holy Scriptures, to be convinced of the benefit which the clergy would themselves derive from a more extended study of the works of creation. And to missionaries especially, a minute familiarity with natural objects must be a powerful assistance in awakening the attention of the savage, who, after his manner, is a close observer, and likely to detect a fallacy in his teacher, should the latter attempt a practical illustration of his discourse without sufficient knowledge. These are not days in which persons who ought to be our guides in matters of doctrine can afford to be behind the rest of the

* Hamilton, "Royal Preacher."

world in knowledge; nor can they safely sneer at the knowledge which puffeth up, until, like the Apostle, they have sounded its depths and proved its shallowness."* It is truly much to be desired that divines and commentators, instead of trying to distort the representations of nature in the Bible into the supposed requirements of a barbarous age, or of setting aside modern discoveries as if they could have no connection with scripture truth, would study natural objects and laws sufficiently to bring themselves in this respect to the level of the Hebrew writers. Such knowledge would be cheaply purchased even by the sacrifice of a part of their verbal and literary training. It is well that this point is now attracting the attention of the christian world, and it is but just to admit that some of our more eminent religious writers—as, for example, Hamilton and Guthrie—have produced noble examples of accurate illustrations of scripture derived from nature. Such examples redeem the church from the charge so eloquently urged by Prof. Peirce, of Harvard, in the following paragraph †:—"Is religion then, so false to God as to avert its face from science? Is the church willing to declare a divorce of this holy marriage tie? Can she afford to renounce the external proofs of a God having sympathy with man? Dare she excommunicate science, and answer, at the judgment, for the souls which are thus reluctantly compelled to infidelity? We reject the authority of the blind scribes and pharisees who

* Harvey, "Nereis Boreali Americana."

† Proceedings American Association, 1854.

have hidden themselves from the light of Heaven under such a darkness of bigotry. We claim our just rights and our share in the church. The man of science is a man, and knows sin as much as other men, and equally with other men he needs the salvation of the gospel. We acknowledge that the revelations of the physical world are addressed to the head, and do not minister to the wants of the heart; we acknowledge that science has no authority to interfere with the Scriptures and perplex the holy writ with forced and impossible constructions of language. This admission does not derogate from the dignity of science; and we claim that the sanctity of the Bible is equally undisturbed by the denial that it was endowed with authority over the truths of physical science. But we, nevertheless, as sons of men, claim our share in its messages of forgiveness, and will not be hindered of our inheritance by the unintelligible technicalities of sectarianism; as children, we kneel to the church and implore its sustenance, and entreat the constant aid and countenance of those great and good men who are its faithful servants and its surest support, whose presence and cheering sympathies are a perpetual benediction, and among whom shine the brightest lights of science as well as of religion. Moreover, as scientific men, we need the Bible to strengthen and confirm our faith in a supreme intellectual Power, to assure us that we are not imposing our forms of thought upon a fortuitous combination of dislocated atoms, but that we may study His works humbly, hopefully, and trusting that the trea-

sury is not yet exhausted, but that there is still left an infinite vein of spiritual ore to be worked by American intellect." It cannot be denied that the Bible, in its references to nature, fully recognizes the claims thus strongly set forth; and which may be urged by the unlettered peasant who merely looks on nature, as well as by the savant who penetrates into its laws.

(2). *Character of the Scriptural Cosmogony in a literary point of view.* A respectable physicist, but somewhat shallow naturalist and theologian of our day, has said of the first chapter of Genesis: "It cannot be history—it may be poetry." Its claims to be history we shall investigate under another head, but it is pertinent to our present inquiry to ask whether it can be poetry. That its substance or matter is poetical, no one who has read it once can believe; but it cannot be denied that in its form it approaches somewhat to that kind of thought-rhythm or parallelism which gives so peculiar a character to Hebrew poetry. We learn from many scripture passages, especially in the proverbs, that this poetical parallelism need not necessarily be connected with poetical thought; that in truth it might be used, as rhyme is sometimes with us, to aid the memory. The oldest acknowledged verse in scripture is a case in point. Lamech, who lived before the flood, appears to have slain a man in self-defence, or at least in an encounter in which he himself was wounded; and he attempts to define the nature of the crime in the following words:—

"Adah and Zillah, hear my voice;
Ye wives of Lamech hearken to my speech:—
I have slain a man to my wounding,
And a young man to my hurt;
If Cain shall be avenged sevenfold,
Truly Lamech seventy and seven fold."

All this is prosaic enough in matter, but the form into which it is thrown gives it a certain dignity, and impresses it on the memory; which last object was probably what the author of this sole fragment of antediluvian literature had in view. He succeeded too—for the sentiment was handed down, probably orally; and Moses incorporates it in his narration, perhaps on account of its interest as the first record of the distinction between wilful murder like that of Cain and justifiable homicide. It is interesting also to observe the same parallelism of style, no doubt with the same objects, in many old Egyptian monumental inscriptions, which, however grandiloquent, are scarcely poetical.*

Now in the first chapter of Genesis and the first three verses of chapter second, being the formal general narrative of creation, on which, as we shall see, every other statement on the subject in the Bible is based, we have this peculiar parallelism of style. If we ask why; the answer must, I think, be—to give dignity and symmetry to what would otherwise be a dry abstract, and still more to aid memory. This last consideration, perhaps indicating that this chapter, like the apology of Lamech, had been handed down orally

* Osburn, Monumental History of Egypt.

for a long period, is the strongest of all the arguments for the so-called "document hypothesis," which supposes the earlier chapters of Genesis to have been merely compiled by Moses from earlier literary fragments. I by no means wish to maintain this hypothesis, now much less in favour than formerly; but on the other hand I cannot believe that it would in any way, if established, invalidate the inspiration of these chapters; since there were prophets and holy men inspired of God before Moses, and if anything revealed to them remained extant in his time, it had a right to appear in its proper place in the sacred literature.

The form of the narrative, however, in no way impairs its precision or accuracy of statement. On this Eichorn well says: "There lies at the foundation of the first chapter a carefully designed plan, all whose parts are carried out with much art, whereby its appropriate place is assigned to every idea"; and we may add, whereby every idea is expressed in the simplest and fewest words, yet with marvellous accuracy, amounting to an almost scientific precision of diction, for which both the form into which it is thrown, and the homogeneous and simple character of the Hebrew language, are very well adapted. Much of this indeed remains in the English version, though our language is less perfectly suited than the Hebrew for the concise announcement of general truths of this description. Our translators have, however, deviated greatly from the true sense of many important words, especially where they have taken the septuagint translation for their guide, as in the words "firmament,"

"whales," "creeping things," &c. These errors will be noticed in subsequent pages. In the mean time I may merely add, that the labours of the ablest biblical critics give us every reason to conclude that the received text of Genesis preserves, almost without an iota of change, the beautiful simplicity of its first chapter; and that we now have it in a more perfect state than that in which it was presented to the translators of most of the early versions.* It must also be admitted that the object in view was best served by that direct reference to the creative fiat, and ignoring of all secondary causes, which are conspicuous in this narrative. This is indeed the general tone of the Bible in speaking of natural phenomena; and this mode of proceeding is in perfect harmony with its claims to divine authority. Had not this course been chosen, no other could have been adopted, in strict consistency with truth, short of a full revelation of the whole system of nature, in the details of all its laws and processes. Had this alternative been adopted, who could have read or comprehended the vast encyclopedia which would have been produced. The moral ends of a revelation would have been sacrificed, and we would have been excluded from the fresh and exciting exploration of actual nature.

Regarded from this point of view—the plenary inspiration of the book—the scriptural references to creation profess to furnish a very general outline, for theological purposes, of the principal features of a vast region unexplored when they

* Davidson, "Biblical Criticism," p. 410. See also Appendix A.

were written, and into which human research has yet penetrated along only a few lines. Natural science, in following out these lines of observation, has reached some of the objects delineated in the scriptural sketch; of others it has obtained distant glimpses; many are probably unknown, and we can appreciate the true value and dimensions relatively to the whole of very few. So vast indeed are the subjects of the bold sketch of the Hebrew prophet, that natural science cannot pretend as yet so to fill in the outline as quite to measure the accuracy of its proportions. Yet the lines, though few, are so boldly drawn, and with so much apparent unity and symmetry, that we almost involuntarily admit that they are accurate and complete This may appear to be underrating the actual progress of science relatively to this great foreshadowing outline; but I know that those most deeply versed in the knowledge of nature will be the least disposed to quarrel with it, what ever skepticism they may entertain as to the greater general completeness of the inspired record.

Another point which deserves a passing notice here, is the theory of Dr. Kurtz and others, that the Mosaic narrative represents a vision of creation, analogous to those prophetic visions which appear in the later books of scripture. This is beyond all question the most simple and probable solution of the origin of the document, when viewed as inspired, but we shall have to recur to it on a future page.

(3). *What is the precise degree of authority to be at-*

tached to the Mosaic cosmogony? It is either an inspired revelation of the Divine procedure in creation, or it is a product of human imagination or research, or a deliberate fraud.

To no part of the Bible do these alternatives more strictly apply than to its first chapter. This "cannot be history" in the strict acceptation of the term. It relates to events which no human eye witnessed, respecting which no human testimony could give any information. It represents the creation of man as the last of a long series of events, of which it professes to inform us. The knowledge of these events cannot have been a matter of human experience. If at all entitled to confidence, the narrative must, therefore, be received as an inspired document, not handed down by any doubtful tradition, but existing as originally transfused into human language from the mind of the Author of nature himself. This view is in no way affected by the hypothesis already mentioned, that the first chapters of Genesis were compiled by Moses from more ancient documents. This merely throws back the revelation to a higher antiquity, and requires us to suppose the agency of two inspired men instead of one.

It would be out of place here to enter into any argument for the inspiration of scripture, or to attempt to define the nature of that inspiration. I merely wish to impress on the mind of the reader, that without the admission of its reality, or at least its possibility, it will be useless to proceed any farther with our inquiry, except as a matter of

curious antiquarian research. We must also on this ground distinguish between the claims of the scriptures and those of tradition or secular history, when they refer to the same facts. The traditions and cosmogonies of some ancient nations have many features in common with the Bible narrative; and, on the supposition that Moses compiled from older documents, they may be portions of this more ancient sacred truth, but clothed in the varied garments of the false and fanciful mythological creeds which have sprung up in later and more degenerate times. Such fragments may safely be received as secondary aids to the understanding of the authentic record, but it would be folly to seek in them for the whole truth. They are but the scattered masses of ore, by tracing which we may sometimes open up new and rich portions of the vein of primitive lore from which they have been derived. It is, however, quite necessary here formally to inquire if there are any hypotheses short of that of plenary inspiration, which may allow us to attach any value whatever to this most ancient document I know but two views of this kind that are worthy of any attention.

1. The Mosaic account of creation may be a result of ancient scientific inquiries, analogous to those of modern geology.

2. It may be an allegorical or poetical mythus, not intended to be historical, but either devised for some extraneous purpose, or consisting of the conjectures of some gifted intellect.

These alternatives we may shortly consider, though the materials for their full discussion can be furnished only by facts to be subsequently stated. I am not aware that the first of these views has been maintained by any modern writer. Some eminent scientific men are, however, disposed to adopt such an explanation of the ancient Hindoo hymns, as well as of the cosmogony of Pythagoras, which bears evidence of this origin; and it may be an easy step to infer that the Hebrew cosmogony was derived from some similar source. Not many years ago, such a supposition would have been regarded as almost insane. Then the science of antiquity was only another name for the philosophy of Greece and Rome. But in recent times we have seen Egypt disclose the ruins of a mighty civilisation, more grand and massive though less elegant than that of Greece, and which had reached its acme ere Greece had received its alphabet—a civilisation which, according to the scripture history, is derived from that of the primeval Cushite empire, which extended from the plains of Shinar over all south-eastern Asia, but was crushed at its centre before the dawn of secular history. We have now little reason to doubt that Moses, when he studied the learning of Egypt, held converse with men who saw more clearly and deeply into nature's mysteries than did Thales or Pythagoras, or even Aristotle.* Still later, the remnants of old Nineveh

* On this subject I may refer naturalists to the intimate acquaintance with animals and their habits, indicated by the manner of their use as sacred emblems, and as symbols in hiero-

have been exhumed from their long sepulture, and antiquaries have been astonished by the discovery that knowledge and arts, supposed to belong exclusively to far more recent times, were, in the days of the early Hebrew kings, and probably very long previously, firmly established on the banks of the Tigris. Such discoveries, when compared with hints furnished by the scriptures, tend greatly to exalt our ideas of the state of civilisation at the time when they were written; and we shall perceive, in the course of our

glyphic writing. Another illustration is afforded by the Mosaic narrative of the miracles and plagues connected with the exodus The Egyptian king, on this occasion, consulted the *philosophers* and *augurs*. These learned men evidently regarded the serpent-rod miracle as but a more skilful form of one of the tricks of serpent charmers. They showed Pharaoh the possibility of reddening the Nile water by artificial means, or perhaps by the development of red algae in it. They explained the inroad of frogs on natural principles, probably referring to the immense abundance ordinarily of the ova and tadpoles of these creatures compared with that of the adults. But when the dust of the land became gnats (lice in our version) this was a phenomenon beyond their experience. Either the species was unknown to them, or its production out of the dry ground was an anomaly, or they knew that no larvae adequate to explain it had previously existed. In the case of this plague, therefore, comparatively insignificant and easily simulated, they honestly confessed—"This is the finger of God." No better evidence could be desired, that the savans here opposed to Moses, were men of high character and extensive observation. Many other facts of similar tendency might be cited both from Moses and the Egyptian monuments.

inquiry, many additional reasons for believing that the ancient Israelites were much farther advanced in natural science than is commonly supposed.

We have, however, no positive proof of such a theory, and it is subject to many grave objections. The narrative itself makes no pretension to a scientific origin, it quotes no authority, and it is connected with no philosophical speculations or deductions. It bears no internal evidence of having been the result of inductive inquiry, but appeals at once to faith in the truth of the great ultimate doctrine of absolute creation, and then proceeds to detail the steps of the process, in the manner of history as recorded by a witness, and not in the manner of science tracing back effects to their causes. Further, it refers to conditions of our planet respecting which science has even now attained to no conclusions supported by evidence, and is not in a position to make dogmatic assertions. The tone of all the ancient cosmogonies has in these respects a resemblance to that of the scriptures, and bears testimony to a general impression pervading the mind of antiquity, that there was a divine and authoritative testimony to the facts of creation, distinct from history, philosophical speculation, or induction.

Under this head, though perhaps belonging rather to the domain of absolute infidelity than to that of scripture exegesis, it may be proper to mention the bold attempt of the authors of the "*Types of Mankind*," to assign a human origin to Genesis 1st. These writers admit the antiquity

of the first chapter, though assigning the rest of the book to a comparatively modern date. They say:—

"The 'document Jehovah'* does not especially concern our present subject; and it is incomparable with the grander conception of the more ancient and unknown writer of Genesis 1st. With extreme felicity of diction and conciseness of plan, the latter has defined the most philosophical views of antiquity upon *cosmogony;* in fact so well, that it has required the palæontological discoveries of the nineteenth century—at least 2500 years after his death—to overthrow his *septenary* arrangement of 'Creation'; which, after all, would still be correct enough in general principles, were it not for one individual oversight, and one unlucky blunder; not exposed, however, until long after his era, by post-Copernican astronomy. The oversight is where he wrote (Gen. i. 6—8): 'Let there be *raquiê*'; i. e., a *firmament;* which proves that his notions of 'sky' (solid like the concavity of a copper basin with *stars* set as brilliants in the metal), were the same as those of adjacent people of his time: indeed, of all men before the publication of Newton's *Principia* and of Laplace's *Mécanique Céleste.* The blunder is where he conceives that *aur*, 'light,' and *iom*, 'day' (Gen. i. 14—18), could have been physically possible *three whole days* before the 'two great luminaries,' *Sun* and *Moon*, were created. These venial errors deducted, his majestic song beautifully illustrates the simple process of ratiocination through which—often without

* See Appendix A.

the slightest historical proof of intercourse — different 'Types of Mankind,' at distinct epochas, and in countries widely apart, had arrived, naturally, at cosmogonic conclusions similar to the doctrines of that Hebraical school of which his harmonic and melodious *numbers* remain a magnificent memento.

"That process seems to have been the following. The ancients knew, as we do, that man *is* upon the earth; and they were persuaded, as we are, that his appearance was preceded by unfathomable depths of time. Unable (as we are still) to measure periods antecedent to man by any *chronological* standard, the ancients rationally reached the tabulation of some events anterior to man, through *induction*—a method not original with Lord Bacon, because known to St. Paul; 'for his unseen things from the creation of the world, his power and godhead, are clearly seen, *being understood by the things that are made*' (Rom. i. 20). Man, they felt, could not have lived upon earth without *animal* food; ergo, 'cattle' preceded him; together with birds, reptiles, fishes, &c. Nothing living, they knew, could have existed without light and heat; ergo, the *solar system* antedated animal life, no less than the *vegetation* indispensable for animal support. But terrestrial plants cannot grow without *earth;* ergo, that dry land had to be separated from pre-existent 'waters.' Their geological speculations inclining rather to the *Neptunian* than to the *Plutonian* theory—for Werner ever preceded Hutton—the ancients found it difficult to 'divide the waters from

the waters' without interposing a metallic substance that 'divided the waters which were *under* the firmament from the waters that were *above* the firmament'; so they inferred, logically, that a *firmament* must have been actually created for this object. [*E. g.*, 'The *windows* of the skies' (Gen. vii. 11); 'the waters *above* the skies' (Ps. cxlviii. 4).] Before the 'waters' (and here is the peculiar error of the genesiacal bard), some of the ancients claimed the pre-existence of *light* (a view adopted by the writer of Genesis 1st); whilst others asserted that 'chaos' prevailed. Both schools united, however, in the conviction that DARKNESS —*Erebus*—anteceded all other *created things*. What, said these ancients, can have existed before the 'darkness?' *Ens entium*, the CREATOR, was the humbled reply. *Elohim* is the Hebrew vocal expression of that climax; to define whose attributes, save through the phenomena of creation, is an attempt we leave to others more presumptuous than ourselves."

The problem here set to the "unknown" author of Genesis, is a hard one:—given the one fact that "man is" to find in detail how the world was formed in a series of preceding ages of vast duration. Is it possible that such a problem could have been so worked out as to have endured the test of 3000 years, and the scrutiny of modern science? But there is an "oversight" in one detail, and a "blunder" in another. By reference farther on, the reader will find under the chapters on "Light" and the "Atmosphere," that the oversight and blunder are those not of the writer

of Genesis, but of the learned American ethnologists in the nineteenth century; a circumstance which cuts in two ways in defence of the ancient author so unhappily unknown to his modern critics.

The second of the alternatives above referred to, the mythical hypothesis, has been advanced and ably supported, especially on the continent of Europe, and by such English writers as are disposed to apply the methods of modern rationalistic criticism to the Bible. In one of its least objectionable forms, it is thus stated by Prof. Powell:

"The narrative then of six periods of creation, followed by a seventh similar period of rest and blessing, was clearly designed by adaptation to their conceptions to enforce upon the Israelites the institution of the Sabbath; and in whatever way its details may be interpreted, it clearly cannot be regarded as an *historical* statement of the *primeval* institution of a sabbath; a supposition which is indeed on other grounds sufficiently improbable, though often adopted. * * If then we would avoid the alternative of being compelled to admit what must amount to impugning the truth of those portions at least of the Old Testament, we surely are bound to give fair consideration to the only suggestion which can set us entirely free from all the difficulties arising from the geological contradiction, which does and must exist against any conceivable interpretation which retains the assertion of the historical character of the details of the narrative, as referring to the distinct transactions of each of the seven periods. * * The one great fact

couched in the general assertion, that all things were created by the sole power of one Supreme Being, is the whole of the representation to which an historical character can be assigned. As to the particular form in which the descriptive narrative is conveyed, we merely affirm that it cannot be history—it may be poetry." *

The general ground on which this view is entertained, is the supposed irreconcileable contradiction between the literal interpretation of the Mosaic record and the facts of geology. The real amount of this difficulty we are not, in the present stage of our inquiry, prepared to estimate. We can, however, readily understand that the hypothesis depends on the supposition that the narrative of creation is posterior in date to the Mosaic ritual, and that this plain and circumstantial series of statements is a fable designed to support the Sabbatical institution, instead of the rite being, as represented in the Bible itself, a commemoration of the previously recorded fact. This is, fortunately, a gratuitous assumption, contrary to the probable date of the documents, as deduced from internal evidence; and it also completely ignores the other manifest uses mentioned under our first head. If proved, it would give to the whole the character of a pious fraud, and would obviously render any comparison with the geological history of the earth altogether unnecessary. While, therefore, it must be freely admitted that the Mosaic narrative cannot be history, in so far at least as history is a product of human experience

* Kitto's Cyclopedia, art. "Creation."

we cannot admit that it is a poetical mythus, or in other words that it is destitute of substantial truth, unless proved by good evidence to be so; and, when this is proved, we must also admit that it is quite undeserving of the credit which it claims as a revelation from God.

Since, therefore, the events recorded in the first chapter of Genesis were not witnessed by man, since there is no reason to believe that they were discovered by scientific inquiry; and since, if true, they cannot be a poetical myth, we must, in the meantime, return to our former supposition that the Mosaic cosmogony is a direct revelation from the Creator. In this respect, the position of this part of the earth's biblical history, resembles that of prophecy. Writers *may* accurately relate contemporary events, or those which belong to the human period, without inspiration; but the moment that they profess accurately to foretell the history of the future, or to inform us of events which preceded the human period, we must either believe them to be inspired, or reject them as impostors or fanatics. Many attempts have been made to find intermediate standing ground, but it is so precarious that the nicest of our modern critical balancers have been unable to maintain themselves upon it.

Having thus determined that the Mosaic cosmogony, in its grand general features, must either be inspired or worthless, we have further to inquire to what extent it is necessary to suppose that the particular details and mode of expression of the narrative, and the subsequent allusions to

nature in the Bible, must be regarded as entitled to this position. We may conceive them to have been left to the discretion of the writers; and, in that case, they will merely represent the knowledge of nature actually existing at the time. On the other hand, their accuracy may have been secured by the divine afflatus. Few modern writers have been disposed to insist on the latter alternative, and have rather assumed that these references and details are accommodated to the state of knowledge at the time. I must observe here, however, that a careful consideration of the facts, gives to a naturalist a much higher estimate of the real value of the observations of nature embodied in the scriptures, than that which divines and expositors have ordinarily entertained; and consequently, that if of human origin, we must be prepared to modify the views generally entertained of early oriental simplicity and ignorance. The truth is, that a large proportion of the difficulties in scriptural natural history appear to have arisen from *want* of such accommodation to the low state of the knowledge of nature among translators and expositors; and this is precisely what we should expect in a veritable revelation. Its moral and religious doctrines were slowly developed, each new light illuminating previous obscurities. Its human history comes out as evidence of its truth, when compared with monumental inscriptions; and why should not the All-wise have constructed as skilfully its teachings respecting His own works. There can be no doubt whatever that the scripture writers intended to address them-

selves to the common mind, which now as then requires simple and popular teaching, but they were under obligation to give truthful statements; and we need not hesitate to say, with Dr. Chalmers, in reference to a book making such claims as those of the Bible—"There is no argument, saving that grounded on the usages of popular language, which would tempt us to meddle with the literalities of that ancient, and, as appears to us, authoritative document, any farther than may be required by those conventionalities of speech which spring from "optical" impressions of nature."*

Attempt as we may to disguise it, any other view is totally unworthy of the great Ruler of the universe, especially in a document characterised as emphatically *the truth*,

* Much that is very silly has been written as to the extent of the supposed "optical view" taken by the Hebrew writers; many worthy literary men appearing to suppose that *scientific* views of nature must necessarily be different from those which we obtain by the evidence of our senses. The very contrary is the fact; and so long as any writers state correctly what they observe, without insisting on any fanciful hypotheses, science has no fault to find with them. What science most detests is the ignorant speculations of those who have not observed at all, or have observed imperfectly. It is a leading excellence of the Hebrew scriptures that they state facts without giving any theories to account for them. It is, on the contrary, the circumstance that unscientific writers will not be content to be "optical," but must theorise, that spoils much of our modern literature, especially in its descriptions of nature.

and in a moral revelation, in which statements respecting natural objects need not be inserted, unless they could be rendered at once truthful and illustrative of the higher objects of the revelation. The statement often so flippantly made, that the Bible was not intended to teach natural history, has no application here. *Spiritual* truths are no doubt shadowed forth in the Bible by material emblems, often but rudely resembling them, because the nature of human thought and language render this necessary, not only to the unlearned, but in some degree to all; but this principle of adaptation cannot be applied to plain material facts. Yet a confusion of these two very distinct cases appears to prevail most unaccountably in the minds of many expositors. They tell us that the scriptures ascribe bodily members to the immaterial God, and typify his spiritual procedure by outward emblems; and this they think analogous to such doctrines as a solid firmament, a plane earth, and others of a like nature, which they ascribe to the sacred writers. We shall find that the writers of the scripture had themselves much clearer views, and that, even in poetical language, they take no such liberties with truth.

As an illustration of the extent to which this doctrine of "accommodation" carries us beyond the limits of fair interpretation, I cite the following passage from one of the latest and ablest writers on the subject*:—"It was the opinion of the ancients that the earth, at a certain height, was surrounded by a transparent hollow sphere of solid

* Prof. Hitchcock.

matter, which they called the firmament. When rain descended, they supposed that it was through windows or holes made in the crystalline curtain suspended in mid-heavens. To these notions the language of the Bible is frequently conformed. * * But the most decisive example I have to give on this subject, is derived from astronomy. Until the time of Copernicus, no opinion respecting natural phenomena was thought better established than that the earth is fixed immovably in the centre of the universe, and that the heavenly bodies move diurnally round it. To sustain this view, the most decisive language of scripture might be quoted. God is there said to have '*established the foundations of the earth, so that they could not be removed for ever;*' and the sacred writers expressly declare that the heavenly bodies *arise and set*, and no where allude to any proper motion of the earth."

Will it be believed, that, with the exception of the poetical expression, "windows of heaven," and the common forms of speech relating to sunrise and sunset, the above "decisive" instances of accommodation have no foundation whatever in the language of scripture. The doctrine of the rotation of solid celestial spheres around the earth, belongs to a Greek philosophy which arose after the Hebrew cosmogony was complete; and though it occurs in the septuagint and other ancient versions, it is not based on the Hebrew original. In truth, we know that those Grecian philosophers—of the Ionic and Pythagorean schools —who lived nearest the times of the Hebrew writers, and

who derived the elements of their science from Egypt and Western Asia, taught very different doctrines. How absurd, then, is it thus to fasten upon the sacred writers, contrary to their own words, the views of a school of astronomy which probably arose long after their time, when we know that more accurate ideas prevailed nearer their epoch. Secondly; though there is some reason for stating that the "ancients;" though certainly not those of Israel, believed in celestial spheres supporting the heavenly bodies, I suspect that the doctrine of a solid vault *supporting the clouds*, except as a mere poetical or mythological fancy, is a product of the imagination of the theologians and closet philosophers of a more modern time. The testimony of men's senses appears to be in favour of the whole universe revolving around a plane earth, though the oldest astronomical school with which we are acquainted, suspected that this is an illusion; but the every-day observation of the most unlettered man who treads the fields and is wet with the mists and rains, must convince him that there is no *sub-nubilar* solid sphere. If, therefore, the Bible had taught such a doctrine, it would have shocked the common sense even of the plain husbandmen to whom it was addressed, and could have found no fit audience except among a portion of the literati of comparatively modern times. Thirdly, with respect to the foundations of the earth, I may remark that in the tenth verse of Genesis there occurs a definition as precise as that of any lexicon,—"and God called the *dry land* earth"; conse-

quently it is but fair to assume that the earth afterwards spoken of as supported above the waters, is the dry land or continental masses of the earth, and no geologist can object to the statement that the dry land is supported above the waters by foundations or pillars.

We shall find in our examination of the document itself, that all the instances of such accommodation which have been cited by writers on this subject, are as baseless as those above referred to. It is much to be regretted that so many otherwise useful expositors have either wanted that familiarity with the aspects of external nature by which all the Hebrew writers are characterised, or have taken too little pains to ascertain the actual meaning of the references to creation which they find in the Bible. I may farther remark that if such instances of accommodation could be found in the later poetical books, it would be extremely unfair to apply them as aids in the interpretation of the plain, precise, and unadorned statements of the first chapters of Genesis. There is, however, throughout even the higher poetry of the Bible, a truthful representation and high appreciation of nature for which we seek in vain in any other poetry, and we may fairly trace this in part to the influence of the cosmogony which appears in its first chapter. The Hebrew was thus taught to recognise the unity of nature as the work of an Almighty Intelligence, to regard all its operations as regulated by his unchanging law or "decree," and to venerate it as a revelation of his supreme wisdom and goodness. On this account he was likely to regard careful observation and representation with

as scrupulous attention as the modern naturalist. Nor must we forget that the old testament literature has descended to us through two dark ages,—that of Greek and Roman polytheism, and of Middle Age barbarism,—and that we must not confound its tenets with those of either. The religious ideas of both these ages were favourable to certain forms of literature and art, but eminently unfavourable to the successful prosecution of the study of nature. Hence we have a right to expect in the literature of the golden age of primeval monotheism, more affinity with the ideas of modern science than in any intermediate time; and the truthful delineation which the claims of the Bible to inspiration require, might have been, as already hinted, to a certain extent secured merely by the reflex influence of its earlier statements, without the necessity of our supposing that illustrations of this kind in the later books came directly from the Spirit of God.

Our discussion of this head of the subject has necessarily been rather desultory, and the arguments adduced must depend for their full confirmation on the results of our future inquiries. The conclusions arrived at may be summed up as follows: 1. That the Mosaic cosmogony must be considered, like the prophecies of the Bible, to claim the rank of inspired teaching, and must depend for its authority on the maintenance of that claim. 2. That the incidental references to nature in other parts of scripture, indicate, at least, the influence of these earlier teachings, and of a pure monotheistic faith, in creating a high and just appreciation of nature among the Hebrew people.

CHAPTER III.

GENERAL VIEWS OF NATURE CONTAINED IN THE HOLY SCRIPTURES.

"What if earth
Be but the shadow of Heaven, and things therein,
Each to other like; more than on earth is thought."

MILTON.

MANY persons may be disposed to concede the accurate delineation of natural facts open to human observation, claimed under the last head, who may not be prepared to find in these ancient books any general views akin to those of the ancient philosophers, or to those obtained by inductive processes in modern times. Yet views of this kind are scattered through the Hebrew and Christian scriptures, and it may be well to add to this preliminary inquiry a statement of them. They resolve themselves, almost as a matter of course, into the two leading ideas of order and adaptation. I have already quoted the eloquent admission by Baron Humboldt of the presence of these ideas of the cosmos in Psalm 104. They are both conspicuous in the narrative of creation, and equally so in a great number of other passages. "Order is heaven's first law"; and the second is like unto it—that everything serves an end. This is the sum of all science. These are the two mites, even all that she hath, which she throws into the treasury of the Lord; and, as she does so in faith, Eternal Wisdom

looks on and approves the deed." * These two mites, lawfully acquired by science, by her independent exertions, she may, however, recognise as of the same coinage with the treasure already laid up in the rich storehouse of the Hebrew literature; but in a peculiar and complex form, which may be illustrated under the following general statements:—

1. The scriptures assert invariable natural law, and constantly recurring cycles in nature. Natural law is expressed as the ordinance or decree of Jehovah. From the oldest of the Hebrew books I select the following examples: †

"When He made a decree for the rain,
And a way for the thunder-flash."

Job xxviii. 26.

"Knowest thou the ordinances of the heavens?
Canst thou establish a dominion even over the earth?"

Job xxxviii. 33.

The later books give us such views as the following:

"He hath established them (the heavens) for ever and ever;
He hath made a decree which shall not pass."

Ps. cxlviii. 6.

* McCosh, "Typical Forms and Special Ends."

† I adopt that view of the date of Job which makes it precede the exodus, because the religious ideas of the book are patriarchal, and it contains no allusions to the Hebrew history or institutions. Were I to suggest an hypothesis as to its origin, it would be that it was written or found by Moses when in exile, and published among his countrymen in Egypt, to revive their monotheistic religion, and cheer them under the apparent desertion of their God, and the evils of their bondage.

"Thou art forever, O Jehovah, thy word is established in the heavens;
Thou hast established the earth, and it abideth;
They continue this day according to thine ordinances, for all are thy servants."

Ps. cxix. 90.

"When he established the clouds above;
When he strengthened the fountains of the deep;
When he gave to the sea his decree,
That the waters should not pass his commandment;
When he appointed the foundations of the earth."

Prov. viii. 28.

Many similar instances will be found in succeeding pages; and in the mean time we may turn to the idea of recurring cycles, which forms the starting-point of the reasonings of Solomon on the current of human affairs, in the book of Ecclesiastes:—"One generation passeth away and another generation cometh; but the earth abideth for ever. The sun also ariseth, and the sun goeth down and hasteneth to its place whence it arose. It goeth toward the south and turneth unto the north. The wind whirleth about continually, and returneth again according to its circuits. All the rivers run into the sea, yet the sea doth not overflow; unto the place whence the rivers came thither they return again." I might fill pages with quotations more or less illustrative of the statement in proof of which the above texts are cited; but enough has been given to show that the doctrine of the Bible is not that of fortuitous occurrence, or of materialism, or of pantheism, or of arbitrary

supernaturalism, but of invariable natural law representing the decree of a wise and unchanging Creator.

2. The Bible recognises progress and development in nature. At the very outset we have this idea embodied in the gradual elaboration of all things in the six creative periods, rising from the formless void of the beginning, through successive stages of inorganic and organic being, up to Eden and to man. Beyond this point the work of creation stops, but there is to be an occupation and improvement of the whole earth by man spreading from Eden. This process is arrested or impeded by sin and the fall. Here commences the special province of the Bible, in explaining the means of recovery from the fall, and of the establishment of a new spiritual and moral kingdom, and finally of the restoration of Eden in a new heaven and earth. All this is moral, and relates to man, in so far as the present state of things is concerned; but we have the commentary of Jesus: "My Father worketh hitherto, and I work";—the remarkable statement of Paul, that the whole creation is involved in the results of man's moral fall and restoration, and the equally remarkable one that the Redeemer is also the maker of the "worlds" or ages of the earth's physical progress, as well as of the future "new heaven and new earth." Peter also rebukes indignantly those scoffers who maintained that all things had remained as they are since the beginning; and refers to the creation week and to the deluge, as earnests of the great changes yet in store for the earth.*

* John v. 17; Rom. viii. 22; Heb. i. 2; 2 Peter iii.

Such views of development and progress are not unknown to many ancient cosmogonies and philosophical systems, but they had no stable foundation in observed fact until the rise of modern geology; which enables us to affirm, that, in addition to those changeless physical laws which cause the bodies of the universe to wheel in unvarying cycles, and all natural powers to reproduce themselves; and, in addition to those organic laws which produce unceasing successions of living individuals; there is a higher law of progress. We can now trace back man, the animals and plants his contemporaries, and others which preceded them, our continents and mountain ranges, and the solid rocks of which they are composed, to their several origins at distinct points of time; and can maintain that since the earth began to wheel around the sun, no succeeding year has seen it precisely as it was in the year before. Nor does any geologist worthy of the name, doubt that this law of progress emanates from the mind and power of one creative Being. When men see in natural law only recurring cycles, they may be pardoned for falling even into the absurdity of believing in eternal succession; but when they see change and progress, and this in a uniform direction, over-mastering recurring cycles, and introducing new objects and powers not accounted for by previous objects or powers, they are brought very near to the presence of the Spiritual Creator. And hence, although no science can reach back to the act of creation, this doctrine is much more strongly

held in our day by geologists than by physicists.* In one thing only does the Bible here part company with natural science. The Bible goes on into the future, and predicts a final condition of our planet, of which science can from its investigations learn nothing.

3. The Bible recognises purpose, use, and special adaptation in nature. It is, in short, full of natural theology of the same kind with that which has been so elaborately worked out by so many modern writers. Numerous passages in support of this will occur to every one who has read the scriptures. It is necessary here, however, to direct attention to a distinction very obvious in scripture, but not always attended to by writers on this subject. The Bible maintains the true "final cause" of all nature to be, not its material and special adaptations or its value to man, but the pleasure or satisfaction of the Creator himself. In the earlier periods of creation, before man was upon the earth, God contemplates his work and pronounces it good. The heavenly hosts praise Him, saying, "Thou hast created all things, and for thy pleasure they are and were created." Further, the Bible represents intelligences higher than man as sharing in the delight which may be derived from the contemplation of God's works. When the earth first rose from the waters to greet the light, "The morning stars sang together, and all the sons of God shouted for joy." There are many things

* See Agassiz contributions to the Natural History of America, and Appendix F.

in nature that strongly impress the naturalist with this same view that the Creator takes pleasure in his works; and, like human genius in its highest efforts, rejoices in production, even if no sentient being should be present to sympathise. The elaborate structures of fossils of which we have only fragmentary remains, the profusion of natural objects of surpassing beauty that grow and perish unseen by us, the delicate microscopic mechanism of nearly all organic structures, point to other reasons for beauty and order than those that concern man. Yet man is represented as the chief created being for whom this earth has been prepared and designed. He obtains dominion over it. A chosen spot is prepared for him, in which not only his wants but his tastes are consulted; and, being made in the image of his Maker, his æsthetic sentiments correspond with the beauties of the Maker's work, and he finds there also food for his reason and imagination. This view of the subject, as well as others already referred to, is finely presented in the address of the Almighty to Job.* Lastly, the Bible very often refers to the special adaptations of natural objects and laws to each other, and to the promotion of the happiness of sentient creatures lower than man. The 104th Psalm is replete with notices of such adaptations, and so is the address to Job; and indeed this view seems hardly ever absent from the minds of the Hebrew writers, but has its highest applications in the

* Job 38th and 39th chaps.

lilies of the field that toil not neither do they spin, and the sparrows that are sold for a farthing, yet the Heavenly Father has clothed the one with surpassing beauty, and provides food for the other, nor allows it to fall without his knowledge. I may, by way of farther illustration, merely name a few of the adaptations referred to in Job 38th and the following chapters. The winds and the clouds are so arranged as to afford the required supplies of moisture to the wilderness where no man is, to "cause the bud of the tender herb to spring forth." For similar objects the tempest is ordered, and the clouds arranged "by wisdom." The adaptations of the wild ass, the wild goat, the ostrich, the migratory birds, the horse, the hippopotamus, the crocodile, to their several habitats, modes of life, and uses in nature, are most vividly sketched and applied as illustrations of the consummate wisdom of the Creator, which descends to the minutest details of organization and habit.

4. The law of type or pattern in nature is distinctly indicated in the Bible. This is a principle only recently understood by naturalists, but it has more or less dimly dawned on the minds of many great thinkers in all ages. Nor is this wonderful, for the idea of type is scarcely ever absent from our own conceptions of any work that we may undertake. In any such work we anticipate recurring daily toil, like the returning cycles of nature. We look for progress, like that of the growth of the universe. We study adaptation both of the several parts to subordinate

uses and of the whole to some general design. But we also keep in view some pattern, style, or order, according to which the whole is arranged, and the mutual relations of the parts are adjusted. The architect must adhere to some order of architecture, and to some style within that order. The potter, the calico-printer, and the silver-smith, must equally study uniformity of pattern in their several manufactures. The Almighty Worker has exhibited the same idea in his works. In the animal kingdom, for instance, we have four leading types of structure. Taking any one of these—the vertebrate, for example—we have a uniform general plan, embracing the vertebral column constructed of the same elements; the members, whether the arm of man, the limb of the quadruped, or the wing of the bat or the bird, or the swimming paddle of the whale, built of the same bones. In like manner all the parts of the vertebral column itself in the same animal, whether in the skull, the neck or the trunk, are composed of the same elementary structures. These types are farther found to be sketched out,—first in their more general, and then in their special features—in proceeding from the lower species of the same type to the higher, in proceeding from the earlier to the later stages of embryonic development, and in proceeding from the more ancient to the more recent creatures that have succeeded each other in geological time. Man, the highest of the vertebrates, is thus the archetype, representing and including all the lower and earlier members of the vertebrate type. The above are but trite and

familiar examples of a doctrine which may furnish and has furnished the material of volumes. There can be no question that the Hebrew Bible is the oldest book in which this principle is stated. In the first chapter of Genesis we have specific type in the creation of plants and animals after their kinds or species, and in the formation of man in the image and likeness of the Creator; and, as we shall find in the sequel, there are some curious ideas of higher and more general types in the grouping of the creatures referred to. The same idea is indicated in the closing chapters of Job, where the three higher classes of the vertebrates are represented by a number of examples, and the typical likeness of one of these—the hippopotamus—to man, seems to be recognised. A late able writer has quoted, as an illustration of the doctrine of types, a very remarkable passage from Psalm cxxxix.:—

"I will praise Thee, for I am fearfully and wonderfully made.
Marvellous are thy works,
And that my soul knoweth right well.
My substance was not hid from Thee
When I was made in secret,
And curiously wrought in the lowest parts of the earth:
Thine eyes did see my substance yet being imperfect,
And in Thy book all my members were written,
Which in continuance were fashioned when as yet there was none of them."

It would too much tax the faith of exegists to ask them to believe that the writer of the above passage, or the spirit

that inspired him, actually meant to teach—what we now know so well from geology, that the prototypes of all the parts of the archetypal human structure may be found in those fossil remains of extinct animals which may, in nearly every country, be dug up from the rocks of the earth. No objection need, however, be taken to our reading in it the doctrine of embryonic development according to a systematic type.

In that spiritual department which is the special field of scripture, the doctrine of type has been so extensively recognised by expositors, that I need only refer to its typical numbers, its typical personages, its typical rites and ceremonies, and lastly, to its recognition of the Divine Redeemer as the great archetype of the spiritual world, as man himself is of the natural. In this last respect the New Testament clearly teaches that, in the resurrection, the human body formed after Adam as its type, is to be sublimated and reformed after the heavenly body of the Son of God, rising to some point of perfection higher than that of the present earthly archetype.

It is more than curious that this idea of type, so long existing in an isolated and often despised form, as a theological thought in the imagery of scripture, should now be a leading idea of natural science; and that while comparative anatomy teaches us that the structures of all past and present lower animals point to man, who, as Prof. Owen expresses it, has had all his parts and organs "sketched out in anticipation in the inferior animals," the Bible

points still farther forward to an exaltation of the human type itself into what even the comparative anatomist might perhaps regard as among the "possible modifications of it beyond those realised in this little orb of ours," could he but learn its real nature.

Under the foregoing heads, of the object, the structure, the authority, and the general cosmical views of the scripture, I have endeavoured to group certain leading thoughts important as preliminary to the study of the subject; and, in now entering on the details of the scriptural cosmogony, I trust the reader will pardon me for assuming that we are studying an inspired book, revealing the origin of nature, and presenting accurate pictures of natural facts and broad general views of the cosmos, at least until in the progress of our inquiry we find reason to adopt lower views; and that he will, in the meantime, be content to follow me in that careful and systematic analysis which a work claiming such a character surely demands.

CHAPTER IV.

THE BEGINNING.

GEN. i. 1: "In the beginning Elohim created the heavens and the earth."

In this opening of the history of creation, we find in a strongly marked manner some of the most prominent characteristics of the books of Moses,—the simplicity and vigour of an early age, the firm faith of the writer in the truths which he promulgates, and the bold and naked assertion of the most grand and comprehensive doctrines. Characteristics these, which well become the earliest communication of the Divine will, and impress us with the feeling that we are listening to words of truth and authority—to the voice not of man but of God. No studied introduction precedes the sacred narrative. No attempt is made to prove the existence of God, or to disprove the eternal existence of matter. The history opens at once with the assertion of a great fundamental truth, which must ever form the basis of true religion and sound philosophy—the production from non-existence of the material universe by the eternal self-existent God.

But what is creation in the sense of the Hebrew writer. The act is expressed by the verb *Bara*, a word of comparatively rare occurrence in the scriptures, and employed to denote absolute creation. If, says Prof. Stuart of Andover,

this word "does not mean to create in the highest sense, then the Hebrews had no word by which they could designate this idea." Yet, like our English create, the word is used in secondary and figurative senses, which in no degree detract from its force when strictly and literally used. Since, however, these secondary senses have been employed by some writers to obscure the primitive meaning, we must examine them in detail.

In the first chapter of Genesis, after the general statement in verse 1st, other verbs signifying to *form* or *make* are used to denote the elaboration of the separate parts of the universe, and the word create is found in only two places, when it refers to the introduction of "great whales" (reptiles) and of man. These uses of the word have been cited to disprove its sense of absolute creation. It must be observed however, that in the first of these cases we have the earliest appearance of animal life, and in the second the introduction of a rational and spiritual nature. Nothing but pure materialism can suppose that the elements of vital and spiritual being were included in the matter of the heavens and the earth as produced in the beginning; and as the scripture writers were not materialists, we may infer that they recognized, in the introduction of life and reason, acts of absolute creation, just as in the origin of matter itself. In Genesis 2nd and 3rd we have a form of expression which well marks the distinction between creation and making. God is there said to have rested from all his works which he "created and made"—literally

created "for or in reference to making," the word for making being one of those already referred to.* The force of this expression consists in its intimating that God had not only finished the work of *creation*, properly so-called, but also the elaboration of the various details of the universe, as formed or fashioned out of the original materials. Of a similar character is the expression in Isaiah xlii., 5—"Jehovah, he that created the heavens and spread them out"; and that in Psalm cxlviii. 5—"He commanded and they were created, he hath also established them for ever and ever." In as far as I am aware, the word *bara* in all the remaining instances of its occurrence in the Pentateuch, refers to the creation of man, with the following exceptions; Exodus xxxiv., 10, "I will do (create) marvels, such as have not been seen in all the earth." Numbers xvi., 30, "If the Lord make a new thing (create a creation) and the earth open her mouth and swallow them up." These verses are types of a class of expressions in which the proper term for creation is applied to the production of something new, strange and marvellous; for instance, "Create in me a clean heart O Lord," "Behold I create new heavens and a new earth." It is however evidently an inversion of sound exposition, to say that these secondary or figurative meanings should determine the primary and literal sense in Genesis 1st. On the contrary, we should rather infer that the inspired writers in these cases selected

* Asah.

the proper word for creation, to express in the most forcible manner the novel and thorough character of the changes to which they refer, and their direct dependence on the Divine will. By such expressions we are in effect referred back to the original use of the word, as denoting the actual creation of matter by the command of God, in contra-distinction from those arrangements which have been effected by the gradual operation of secondary agents, or of laws attached to matter at its creation.* Viewing creation in this light, we need not perplex ourselves with the question whether we should consider Genesis i., 1 to refer to the essence of matter as distinguished from its qualities. We may content ourselves with the explanation given by Paul in the eleventh of Hebrews. "By faith we are certain that the worlds were created by the decree of God, so that things which *are seen*, were made of that which *appears not.*"

The *nature* of the act of creation being thus settled, its *extent* may be ascertained by an examination of the terms heaven and earth.

The word heavens (*Shamayim*) has in Hebrew as in English a variety of significations. Of material heavens there are, in the quaint language of Poole, "*tres regiones, ubi aves, ubi nubes, ubi sidera*"; or (1) the atmosphere

* I am indebted, since writing the above, to McDonald's able treatise on "Creation and the Fall," for the additional idea in reference to the word *bara*, that it is applied only to God as the agent, and not to any human work.

or firmament;* (2.) The region of clouds in the upper part of the atmosphere;† (3.) The depths of space comprehending the starry orbs.‡ Beside these we have the "heaven of heavens," the abode of God and Spiritual beings.§ The application of the term heaven to the atmosphere will be considered when we reach the 6th and 7th verses. In the meantime we may accept the word in this verse, as including the material heavens in the widest sense. (1.) Because it is not here, as in verse 8th, restricted to the atmosphere by the terms of the narrative; this restriction in verse 8th in fact implying the wider sense of the word in preceding verses. (2.) Because the atmospheric firmament, elsewhere called heaven, divides the waters above from those below, whereas it is evident that all these waters, and of consequence the materials of the atmosphere itself, are included in the earth of the following verse. (3.) Because in verse 14, the sidereal heavens are spoken of as arranged from pre-existing materials, which refers their actual creation back to this verse.

In the verse now under consideration we therefore regard the heavens as including the whole material universe beyond the limits of our earth. That this sense of the word is not unknown to the writers of scripture, and that they had enlarged and rational views of the star-spangled

* Gen. i., 8, 26, 27, 28.

† Gen. ix., 11; Job xxxviii, 37.

‡ Gen. i., 14; Judges v., 20; Deuteronomy xvii., 3.

§ Gen. xxviii., 17; Job xv., 15; Psalms ii., 4.

abysses of space, will appear from the terms employed by Moses in his solemn warning against the Sabaean idolatry, in Deuteronomy 4th. "And lest thou lift up thine eyes to the heavens, and when thou seest the sun and the moon and the stars, even all the host of the heavens, shouldest be incited to worship them and serve them which Jehovah thy God hath appointed to all nations under the whole heavens." To the same effect is the expression of the awe and wonder of the poet king of Israel in Psalm 8th:—

"When I consider the heavens, the work of thy fingers,
The moon and the stars which thou hast ordained,
What is man that thou art mindful of him."

I may observe, however, that throughout the scriptures the word in question is much more frequently applied to the atmosphere than to the sidereal heavens. The reason of this appears in the terms of verse 8th.

If we have correctly referred the term heavens to the starry and planetary bodies, then the word *earth* must denote our globe as a planetary body, with all the liquid and aeriform substances on its surface. The arrangement of the whole universe under the heads heaven and earth, has been derided as a division into "infinity and an atom"; but when we consider the relative importance of the earth to us, and that it constitutes the principal object of the whole revelation to which this verse introduces us, this absurdity disappears, and we recognise the classification as in the circumstances natural and rational. The word

earth (*aretz*) is, however, generally used to denote the dry land, or even a region or district of country. It is indeed expressly restricted to the dry land in verse 10th; but as in the case of the parallel limitation of the word heaven, we may consider this as a hint that its previous meaning is more extended. That it really is so, appears from the following considerations: (1.) It includes the deep, or the material from which the sea and atmosphere were afterwards formed. (2.) The subsequent verses show that at the period in question no dry land existed. If instances of a similar meaning from other parts of scripture are required, I give the following: Gen. ii., 1 to 4, "Thus the heavens and the earth were finished and all the host of them"—"these are the generations of the heavens and the earth." In this general summary of the creative work, the earth evidently includes the seas and all that is in them, as well as the dry land; and the whole expression denotes the universe. The well known and striking remark of Job—"Who hangeth the earth upon nothing" is also a case in point, and must refer to the whole world, since in other parts of the same book, the dry land or continental masses of the earth are said, and with great truth and propriety, to be supported above the waters on pillars or foundations. The following passages may also be cited as instances of the occurrence of the idea of the whole world expressed by the word earth, Exodus ix., 29, "And Moses said unto him, as soon as I am gone out of the city, I will spread abroad my hands unto the Lord, and the thunder shall cease, neither shall there be any more

hail; that thou mayest know the earth is the Lord's." Deuteronomy x., 14, "Behold the heaven and the heaven of heavens is the Lord's, the earth also and all that therein is."

The material universe was brought into existence in the "beginning,"—a term evidently indefinite as far as regards any known epoch, and implying merely priority to all other recorded events. It cannot be the first day, for there is no expressed connection, and the work of the first day is distinct from that of the beginning. It cannot be a general term for the whole six days, since these are separated from it by that chaotic or formless state to which we are next introduced. The beginning, therefore, is the threshold of creation — the line that separates the old tenantless condition of space from the world-crowded galaxies of the existing universe. The only other information respecting it, that we have in scripture, is in that fine descriptive poem in Proverbs viii., in which the Wisdom of God personified—by many believed to represent the second person of the Trinity, who, as we are informed in the New Testament, was the manifested Deity in the work of creation as well as in that of redemption—narrates the origin of all created things:—

'Jehovah possessed me in the beginning of his way,
Before his work of old.
I was set up (anointed) from everlasting,
From the beginning or ever the earth was;
When there were no deeps I was brought forth,
When there were no fountains abounding in water."

The beginning here precedes the creation of the earth, as well as of the deep which encompassed its surface in its earliest condition. The beginning, in this point of view, stretches back from the origin of the world into the depths of eternity. It is to us emphatically *the* beginning, because it witnessed the birth of our material system; but to the eternal Jehovah it was but the beginning of a great series of his operations, and we have no information of its absolute duration. From the time when God began to create the celestial orbs, until that time when it could be said that he had created the heavens and the earth, countless ages may have rolled along, and myriads of worlds may have passed through various stages of existence, and the creation of our planetary system may have been one of the last acts of that long beginning.

The author of creation is Elohim, or God in his general aspect to nature and man, and not in that special aspect in reference to the Hebrew commonwealth and to the work of redemption, indicated by the name Jehovah (*Iaveh*).* We need not enter into the doubtful etymology of the word; but may content ourselves with that supported by many, perhaps the majority, of critics, which gives it the meaning of "Object of dread or adoration," or with that preferred by Gesenius, which makes it mean the "Strong or mighty one." Its plural form has also greatly tried the ingenuity of the commentators. After carefully consider-

* Appendix A.

ing the various hypotheses, such as that of the plural of majesty of the Rabbins, and the primitive polytheism supposed by certain rationalists, I can see no better reason than an attempt to give a grammatical expression to that plurality in unity, indicated by the appearance of the Spirit as a distinct actor in the next verse, and probably always held by the Hebrews in a general form; and which our Saviour and his apostles specialised in that trinitarian doctrine which enables both John and Paul explicitly to assert the agency of the second person of the Trinity in the creative work. I rather wonder at the squeamishness which induced even Calvin to make light of this manifest correspondence between Moses and the Apostles.

CHAPTER V.

THE DESOLATE VOID.

GENESIS i. 2: "And the earth was desolate and empty, and darkness was upon the surface of the deep; and the Spirit of God brooded over the surface of the waters."

We have here a few bold outlines of a dark and mysterious scene—a condition of the earth of which we have no certain intimation from any other source. It was "emptiness and vacuity," formless and uninhabited. The words thus translated are sufficiently plain in their meaning. The first is used by Isaiah to denote the desolation of a ruined city, and in Job and the Psalms as characteristic of the wilderness or desert. Both in connection are employed by Isaiah to express the desolation of Idumea, and by Jeremiah in a powerful description of the ruin of nations by God's judgments. When thus united, they form the strongest expression which the Hebrew could supply, for solitary, uninhabited desolation, like that of a city reduced to heaps of rubbish, and to the silence and loneliness of utter ruin.

In the present connection, these words inform us that the earth was then destitute of life, and unfit for the residence of organised beings. The words themselves suggest the important question:—Was this the original condition of the earth? Was it a scene of desolation and confusion

when it sprang from the hand of its Creator? or was this state of ruin consequent on convulsions which may have been preceded by a very different condition, not mentioned by the inspired historian? That it may have been so, is rendered possible by the circumstance that the words employed are generally used to denote the ruin of places formerly inhabited, and by the want of any necessary connection in time between the first and second verses. It has even been proposed, though this does violence to the construction, to read "and the earth became" desolate and empty. Farther, it seems, *a priori*, improbable that the first act of creative power should have resulted in the production of a mere chaos. The crust of the earth also shows, in its alternations of strata and organic remains, evidence of a great series of changes extending over vast periods, and which might, in a revelation intended for moral purposes, with great propriety be omitted.

For such reasons, some eminent expositors of these words, are disposed to consider the first verse as a title or introduction, and to refer to this period the whole series of geological changes; and this view indeed forms at present one of the most popular solutions of the apparent discrepancies between the geological and scriptural histories of the world. It is evident, however, that if we view the term "earth" in verse second as including the whole globe, this hypothesis becomes altogether untenable. The subsequent verses inform us that at the period in question the earth was covered by a universal ocean, possessed no

atmosphere and received no light, and had not entered into its present relations with the other bodies of our system. No conceivable convulsions could have effected such changes on an earth previously possessing these arrangements; and geology assures us that the existing laws and arrangements in these respects have prevailed from the earliest periods to which it can lead us back, and that the modern state of things was not separated from those which preceded it by any such general chaos.* To avoid this difficulty, which has been much more strongly felt, as these facts have been more and more clearly developed by geological science, Dr. J. P. Smith has endeavoured to show that the earth in verse second may mean only a particular region, temporarily obscured and reduced to ruin, and about to be fitted up, by the operations of the six days, for the residence of man; and that consequently the narrative of the six days refers not to the original arrangement of the surface, relations, and inhabitants of our planet, but to the retrieval from ruin and re-peopling of a limited territory, supposed to have been in Central Asia, and which had been submerged and its atmosphere obscured by aqueous or volcanic vapours. The chief support of this view is the fact, previously noticed, that the word earth is very frequently used in the signification of region, district, country; to which may be added the supposed necessity for harmonising the scriptures with geological discovery, and at the same time viewing the days of creation as literal solar days.

*Appendix B.

Can we, however, after finding that in verse 1st the term earth must mean the whole world, suddenly restrict it in verse second to a limited region. Is it possible that the writer who in verse tenth for the first time intimates a limitation of the meaning of this word, by the solemn announcement "And God called the *dry land* earth," should in a previous verse use it in a much more limited sense without any hint of such restriction. The case stands thus. A writer uses the word earth in the most general sense; in the next sentence he is supposed, without any intimation of his intention, to use the same word to denote a region or country, and by so doing entirely to change the meaning of his whole discourse, from that which would otherwise have attached to it. Yet the same writer when, a few sentences farther on, it becomes necessary for him to use the word earth to denote the dry land as distinguished from the seas, formally and with an assertion of Divine authority, intimates the change of meaning. Is not this supposition contrary not only to sound principles of interpretation, but also to common sense; and would it not tend to render worthless the testimony of a writer to whose diction such inaccuracy must be ascribed. It is in truth to me beyond measure surprising that such a view could ever have obtained currency; and I fear it is to be attributed to a determination, at all hazards and with any amount of violence to the written record, to make geology and religion coincide. Must we then throw aside this simple and con-

venient method of reconciliation, sanctioned by Chalmers, Smith, Harris, King, Hitchcock, and many other great or respectable names, and on which so many good men complacently rest. Truth obliges us to do so, and to confess that both geology and scripture refuse to be reconciled on this basis. We may still admit that the lapse of time between the beginning and the first day may have been great; but we must emphatically deny that this interval corresponds with the time indicated by the series of fossiliferous rocks.

Before leaving this part of the subject, I may remark that the desolate and empty condition of the earth was not a chaotic mass of confusion, "*rudis indigestaque moles*"; but in reality, when physically considered, a more symmetrical and homogeneous condition than any that it subsequently assumed. The absence of land, and the prevalence of a universal ocean in the immediately succeeding period, imply that its crust had not yet been ruptured or disturbed, but presented an even and uniform surface, no part of which could project above the comparatively thin fluid envelope.

The second clause introduces a new object—"*the deep.*" Whatever its precise nature, this is evidently something included in the earth of verse 1st, and created with it. The word occurs in other parts of the Hebrew scriptures in various senses. It often denotes the sea, especially when in an agitated state (Ps. xlii., 8; Job xxxviii., 10). In Psalm cxxxv. however, it is distinguished from the sea:

"Whatever the Lord pleased that did he in heaven, in the earth, in the sea and *in all deeps.*" In other cases it has been supposed to refer to interior recesses of the earth, as when at the deluge "the fountains of the great deep" are said to have been broken up. It is probable however that this refers to the ocean. In some places it would appear to mean the atmosphere or its waters; as Prov. viii., 7, "When he prepared the heavens I was there, when he described a circle on the face of the deep, when he established the clouds above, when he strengthened the fountains of the deep." The septuagint in this passage reads "throne on the winds" and "fountains under the heaven."* Though we cannot attach much value to these readings, there seems little reason to doubt that the author of this passage understands by the deep the atmospheric waters, and not the sea, which he mentions separately. The same meaning must be attached to the word in the 19th and 20th verses of the same chapter: "The Lord in wisdom hath founded the earth, by understanding hath He established the heavens; by his knowledge the depths are broken up, and the clouds drop down the small rain."

In the passage now under consideration, it would seem that we have both the deep and the waters mentioned, and this not in a way which would lead us to infer their identity. The darkness on the surface of the deep and the spirit of God on the face of the waters, seem to refer to the

* The usual septuagint rendering is *Abyssus.*

condition of two distinct objects at the same time. Neither can the word here refer to subterranean cavities, for the ascription of a surface to these, and the statement that they were enveloped in darkness, would in this case have neither meaning nor use. For these reasons I am induced to believe that the locality of the deep or abyss is to be sought, not in the universal ocean or the interior of the earth, but in the vaporous or aeriform mass mantling the surface of our nascent planet, and containing the materials out of which the atmosphere was afterwards elaborated. This is a view leading to important consequences: one of which is that the darkness on the surface of the deep cannot have been, as believed by the advocates of a local chaos, a mere atmospheric obscuration; since even at the *surface* of what then represented the atmosphere, darkness prevailed. "God covered the earth with the deep as with a garment, and the waters stood above the hills," and without this outer garment was the darkness of space destitute of luminaries, at least of those greater ones which are of primary importance to us. We learn from the following verses, that there was no layer of clear atmosphere in this misty deep, separating the clouds from the ocean waters.

The last clause of the verse has always been obscure, and perhaps it is still impossible to form a clear idea of the operation intended to be described. We are not even certain whether it is intended to represent anything within the compass of ordinary natural laws, or to denote a direct intervention of the Creator, miraculous in its nature and con-

fined to one period. It is possible that the general intention of the statement may be to the effect that the agency of the Divine power in separating the waters from the incumbent vapours, had already commenced—that the spirit which would afterwards evoke so many wonders out of the chaotic mass, was already acting upon it in an unseen and mysterious way, preparing it for its future destinies.

Some commentators, both Jewish and Christian, are, however, disposed to view the *Ruach Elohim*, or Spirit of God, as meaning a wind of God, or mighty wind, according to a well-known Hebrew idiom. The word unquestionably often means wind or breath, and there are undoubted instances of the expression "wind of God" for a great or strong wind. For example, Isaiah xl. 7: "The grass withereth because the wind of the Lord bloweth upon it"; see also 2 Kings ii. and 16. Such examples, however, are very rare, and by no means sufficient of themselves to establish this interpretation. Those who hold this view, do so mainly in consideration of the advantage which it affords in attaching a definite meaning to the expression. Many of them are not, however, aware of its precise import in a cosmical point of view. A violent wind, before the formation of the atmosphere, and the establishment of the laws which regulate the suspension and motions of aqueous vapour and clouds, must have been merely an agitation of the confused misty and vaporous mass of the deep; since, as Ainsworth—more careful than modern interpreters—long ago observed, "winde (which is the moving of the

aier) was not created till the second day, that the firmament was spred, and the aier made." Such an agitation is by no means improbable. It would be a very likely accompaniment of a boiling ocean, resting on a heated surface, and of excessive condensation of moisture in the upper regions of the atmosphere; and might act as an influential means of preparing the earth for the operations of the second day. It is curious also that the Phenician cosmogony is said to have contained the idea of a mighty wind in connection with this part of creation. On the other hand the verb used in the text, rather expresses hovering or brooding than violent motion, and this better corresponds with the old fable of the mundane egg, which seems to have been derived from the event recorded in this verse. The more evangelical view which supposes the Holy Spirit to be intended, is also more in accordance with the general scope of the scripture teachings on this subject; and the opposite idea is, as Calvin well says, "too frigid" to meet with much favour from evangelical theologians.

Chaos, the equivalent of the Hebrew "desolation and emptiness" figures largely in all ancient cosmogonies. That of the Egyptians is interesting not only from its resemblance to the Hebrew doctrine, but also from its probable connection with the cosmogony of the Greeks. Taking the version of Diodorus Siculus, which though comparatively modern, yet corresponds with the hints derived from older sources, we find the original chaos to have been an intermingled condition of the elements constituting

heaven and earth. This is the Hebrew "deep." The first step of progress is the separation of these; the fiery particles ascending above, and not only producing light but the revolution of the heavenly bodies—a curious foreshadowing of the nebular hypothesis of modern astronomy. After these, in the terms of the lines quoted by Diodorus from Euripides, plants, birds, mammals and finally man are produced, not however by a direct creative fiat but by the spontaneous fecundity of the teeming earth. The Phenician cosmogony attributed to Sancuniathon has the void, the deep, and the brooding spirit, and one of the terms employed, "baau," is the same with the Hebrew "bohu," void, if read without the points. The Babylonians, according to Berosus, believed in a chaos — which, however, like the literal day theory of some moderns, produced many monsters before Belus intervened to separate heaven and earth. The Greek myth of Chaos and its children Erebus and Night, who gave birth to Aether and Day, is the same tradition, personified after the fanciful manner of a people who, in the primitive period of their civilization, had no profound appreciation of nature, but were full of human sympathies.* Lastly, in a hymn translated by Dr.

* It is impossible to avoid recognizing in the Greek Theogony, as it appears in Hesiod and the Orphic poems, an inextricable intermingling of a cosmogony akin to that of Moses, with legendary stories of deceased ancestors. Chaos or space, for the chaos of Hesiod differs from that of Ovid, came first, then Gaea the earth and Tartarus or the lower world. Chaos gave birth to

Max Muller from the Rig veda, a work probably far older than the Institutes of Menu, we have such utterances as the following:—

"Nor aught nor nought existed; yon bright sky
Was not, nor heaven's broad woof outstretched above.
What covered all? what sheltered? what concealed?
Was it the water's fathomless abyss? * * * *
Darkness there was, and all at first was veiled
In gloom profound—an ocean without light;
The germ that still lay covered in the husk
Burst forth, one nature, from the fervent heat."

Erebos (identical with the Hebrew Ereb, or Erev, evening) and Nyx, or night. These again give birth to Aether, the equivalent of the Hebrew expanse or firmament, and to Hemera, the day, and then the heavenly bodies were perfected. So far the legend is apparently based on some primitive history of creation, not essentially different from that of the Bible. But the Greek Theogony here skips suddenly to the human period; and under the fables of the marriage of Gaea and Uranos, and the Titans, appears to present to us the antediluvian world with its intermarriages of the sons of God and men, and its Nephelim or Giants, with their mechanic arts and their crimes. Beyond this, in Kronos and his three sons, and in the strange history of Zeus, the chief of these, we have a coarse and fanciful version of the story of the family of Noah, the insult offered by Ham to his father, and the subsequent quarrels and dispersion of mankind. The Zeus of Homer appears to be the elder of the three, or Japhet, the real father of the Greeks, according to the Bible; but in the time of Hesiod, Zeus was the youngest, perhaps indicating that the worship of the Egyptian Zeus, Ammon or Ham, had already supplanted among the Greeks that of their own ancestor. But it is curious that

It is evident that the state of our planet which we have just been considering, is one of which we can scarcely form any adequate conception, and science can in no way aid us, except by suggesting hypotheses or conjectures. It is remarkable however, that nearly all the cosmological theories which have been devised, contain some of the elements of the inspired narrative. The words of Moses appear to suggest a heated and cooling globe, its crust as yet unbroken by internal forces, covered by a universal ocean, on which rested a mass of confused vaporous substances; and

even in the Bible, though Japhet is said to be the greater, he is placed last in the lists. After the introduction of Greek savans and literati to Egypt, about B. C. 660, they began to regard their own mythology from this point of view, though obliged to be reserved on the subject. The cosmology of Thales, the astronomy of Anaxagoras, and the history of Herodotus afford early evidence of this, and it abounds in later writers. I may refer the reader to Grote (History of Greece, vol. 1) for an able and agreeable summary of this subject; and may add, that even the few coincidences above pointed out between Greek mythology and the Bible, independently of the multitudes of more doubtful character to be found in the older writers on this subject, appear very wonderful, when we consider that among the Greeks these vestiges of primitive religion, whether brought with them from the east or received from abroad, must have been handed down for a long time by oral tradition among the people; but obscure though they may be, the circumstance that some old writers have ridden the resemblances to death, affords no excuse for the prevailing neglect of them in more modern times. (See Appendix K.)

it is of such materials, thus combined by the sacred historian, that cosmologists have built up their several theories, aqueous or igneous, of the early state of the earth. Geology, as a science of observation and induction, does not carry us back to this period. It must still and always say, with Hutton, that it can find "no trace of a beginning, no prospect of an end,"—not because there has been no beginning or will be no end, but because the facts which it collects extend neither to the one nor the other. Geology, like every other department of natural history, can but investigate the facts which are open to observation, and reason on these in accordance with the known laws and arrangements of existing nature. It finds these laws to hold for the oldest period to which the rocky archives of the earth extend. Respecting the origin of these general laws and arrangements, or the condition of the earth before they originated, it knows nothing. In like manner a botanist may determine the age of a forest, by counting the growth rings of the oldest trees, but he can tell nothing of the forests that may have preceded it, or of the condition of the surface before it supported a forest. So the archaeologist may on Egyptian monuments read the names and history of successive dynasties of kings, but he can tell nothing of the state of the country and its native tribes before those dynasties began, or their monuments were built. Yet Geology at least establishes a probability that a time was when organized beings did not exist, and when many of the arrangements of the surface of our earth had not been

perfected; and the few facts which have given birth to the theories promulgated on this subject, tend to show that this pre-geological condition of the earth may have been such as that described in the verses now under consideration. I may remark in conclusion, that if the words of Moses imply the cooling of the globe from a molten or intensely heated state, down to a temperature at which water could exist on its surface, the known rate of cooling of bodies of the dimensions and materials of the earth, shows that the time included in these two verses of Genesis, must have been enormous.*

There are two other sciences beside geology, which have in modern times attempted to penetrate into the mysteries of the primitive abyss, at least by hypothetical explanations—astronomy and chemistry. The magnificent nebular hypothesis of La Place, which explains the formation of the whole solar system by the condensation of a revolving mass of gaseous matter, would manifestly bring our earth to the condition of a fluid body with or without a solid crust, and surrounded by a huge atmosphere of its more volatile materials, gradually condensing itself around the central nucleus. Chemistry informs us that this vaporous mass would contain not only the atmospheric air and water, but all the carbon, sulphur, phosphorus, chlorine, and other elements, volatile in themselves, or forming volatile compounds with oxygen or hydrogen, that are now imprisoned in various states of condensation in the solid crust of the earth.

* Appendix C.

Such an atmosphere, vast, dark, pestilential, and capable in its condensation of producing the most intense chemical action, is a necessity of an incandescent globe, or of an earth condensing from a nebulous state, not often referred to by writers on these subjects; and affords no inapt representation of the deep or abyss of Moses, and the chaos of Hesiod, and of the Egyptian priests.

In accordance with the views above stated and explained, verses first and second may be paraphrased as follows:—

"At a far-distant time, Elohim, the triune God, created the materials of the heavens and the earth."

"After its creation, the earth was still without organised inhabitants. It was covered with a dense and heterogeneous mantle of vapours, and it was entirely destitute of solar light and heat; but processes preparatory to its being perfected and inhabited, were in progress."

CHAPTER VI.

LIGHT.

GENESIS i. 3: "And God said let light be, and light was; and God saw the light that it was good, and separated the light from the darkness."

LIGHT is the first element of order and perfection introduced upon our planet—the first innovation on the old regime of darkness and desolation. There is a beautiful propriety in this, for the Hebrew *Or* (light) should be viewed as including heat and electricity as well as light; and these three elements—if they are really distinct and not merely various movements of one ether—imponderable and in some states scarcely appreciable, are in themselves or the proximate causes of their manifestation, the prime movers of the machinery of nature, the vivifying forces without which the primeval desolation would have been eternal. The statement presented here is, however, a bold one. Light without luminaries, which were afterwards formed—independent light, so to speak, shining all around the earth, is an idea not likely to have occurred in the days of Moses to the framer of a fictitious cosmogony, and yet it corresponds in a remarkable manner with some of the theories which have grown out of modern induction.

I have said that the Hebrew word translated light, includes all the imponderables. I make this statement, not

intending to assert that the Hebrews experimented on these substances in the manner of modern science, and would therefore be prepared to understand their distinctions as fully as we can. I give the word this general sense simply because throughout the Bible it is used to denote the solar light and heat, and also the electric light of the thunder-cloud: "the light of His cloud," "the bright light which is in the clouds." The absence of "*or*," therefore, in the primeval earth, is the absence of solar radiation, of the lightning's flash, and of volcanic fires. We shall in the succeeding verses find additional reasons for excluding all these phenomena from the darkness of the primeval night.

The light of the first day cannot reasonably be supposed to have been in any other than a visible and active state. Whether light be, as supposed by the older physicists, luminous matter radiated with immense velocity, or as now appears more probable, merely the undulations of a universally diffused ether, its motion had already commenced. The idea of the matter of light as distinct from its power of affecting the senses, does not appear in the scriptures; and if it did, the general creation of matter being stated in verse 1st, and the notice of the separation of light and darkness being distinctly given in the present verse, there is no place left for such a view here. For this reason, that explanation of this verse which supposes that on the first day the *matter* of light, or the ether whose motions produce light, was created, and that on the fourth day,

when luminaries were appointed, it became visible by beginning to undulate, must be abandoned; and the connection between these two statements must be sought in some other group of facts than that connected with the existence of the matter of light as distinct from its undulations.

What, then, was the nature of the light which on the first day shone without the presence of any local luminary? It must have proceeded from luminous matter diffused through the whole space of the solar system, or surrounding our globe as with a mantle. It was "clothed with light as with a garment,"

"Sphered in a radiant cloud, for yet the sun was not."

We have already rejected the hypothesis that the primeval night proceeded from a temporary obscuration of the atmosphere; and the expression, "God said let light be," affords an additional reason, since, in accordance with the strict precision of language which everywhere prevails in this ancient document, a mere restoration of light would not be stated in such terms. If we wish to find a natural explanation of the mode of illumination referred to, we must recur to one or other of the suppositions mentioned above, that the luminous matter formed a nebulous atmosphere, slowly concentrating itself toward the centre of the solar system, or that it formed a special envelope of our earth, which subsequently disappeared.

We may suppose, in the first place, this luminous matter to be the same with that which now surrounds the sun, and constitutes the stratum of luminous substance, which, by its wondrous and unceasing power of emitting light, gives him all his glory. To explain the division of the light from the darkness, we need only suppose that the luminous matter, in the progress of its concentration, was at length all gathered within the earth's orbit, and then as one hemisphere only would be illuminated at a time, the separation of light from darkness or of day from night would be established. This hypothesis, suggested by the words themselves, affords a simple and natural explanation of a statement otherwise obscure.

It is an instructive circumstance that the probabilities respecting the early state of our planet, thus deduced from the scriptural narrative, correspond very closely with the most ingenious and truly philosophical speculation ever hazarded respecting the origin of our solar system. I refer to the cosmical hypothesis of La Place, which was certainly formed without any reference to the Bible; and by persons whose views of the Mosaic narrative are of that shallow character which is too prevalent, has been suspected as of infidel tendency. La Place's theory is based on the following properties of the solar system, for a statement of which and of the views founded on them, I am indebted to Nichols' "System of the World." 1. The orbits of the planets are nearly circular. 2. They revolve nearly

in the plane of the sun's equator.* 3. They all revolve round the sun in one direction, which is also the direction of the sun's rotation. 4. They rotate on their axes also, as far as is known, in the same direction. 5. Their satellites, with the exception of those of Uranus, revolve in the same direction. Now all these coincidences can scarcely have been fortuitous, and yet they might have been otherwise without affecting the working of the system; and farther, if not fortuitous, they correspond precisely with the results which would flow from the condensation of a revolving mass of nebulous matter.† La Place, therefore, conceived that in the beginning the matter of our system existed in the condition of a mass of vaporous material, having a central nucleus more or less dense, and the whole rotating in a uniform direction. Such a mass must, "in condensing by cold, leave in the plane of its equator zones of vapour composed of substances which required an intense degree of cold to return to a liquid or solid state. These zones must have begun by circulating round the sun in the form of concentric rings, the most volatile molecules of

* The group of minor planets discovered in more recent times between Mars and Jupiter, form an exception to this; but they are of little importance, and exceptional in other respects as well. To give their arrangement and the motions of the satellites of Uranus, would require the farther assumption of some unknown disturbing cause.

† For a very clear statement of this, see Nichols' "Planetary System."

which must have formed the superior part, and the most condensed the inferior part. If all the nebulous molecules of which these rings are composed had continued to cool without disuniting, they would have ended by forming a liquid or solid ring. But the regular constitution which all parts of the ring would require for this, and which they would have needed to preserve when cooling, would make this phenomenon extremely rare. Accordingly the solar system presents only one instance of this, that of the rings of Saturn. Generally the ring must have broken into several parts which have continued to circulate round the sun, and with almost equal velocity, whilst at the same time, in consequence of their separation, they would acquire a rotatory motion round their respective centres of gravity; and as the molecules of the superior part of the ring—that is to say, those farthest from the centre of the sun—had necessarily an absolute velocity greater than the molecules of the inferior part which is nearest it, the rotatory motion common to all the fragments must always have been in the same direction with the orbitual motion. However, if after their division one of these fragments has been sufficiently superior to the others to unite them to it by its attraction, they will have formed only a mass of vapour, which, by the continual friction of all its parts, must have assumed the form of a spheroid, flattened at the poles and elongated in the direction of its equator." Here, then, are rings of vapour left by the successive retreats of the atmosphere of the sun, changed into so many planets in

the condition of vapour, circulating round the central orb, and possessing a rotatory motion in the direction of their revolution, while the solar mass was gradually contracting itself round its centre and assuming its present organised form. Such is a general view of the hypothesis of La Place, which may also be followed out into all the known details of the solar system, and will be found to account for them all. Into these details, however, we cannot now enter. Let us now compare this ingenious speculation with the scripture narrative. In both we have the raw material of the heavens and the earth created before it assumed its distinct forms. In both we have that state of the planets characterised as without form and void, the condensing nebulous mass of La Place's theory being in perfect correspondence with the scriptural "deep." In both it is implied that the permanent mutual relations of the several bodies of the system must have been perfected long after their origin. Lastly, supposing the luminous atmosphere of our sun to have been of such a character as to concentrate itself wholly around the centre of the system, and that as it became concentrated it acquired its intense luminosity, we have in both the production of light from the same cause; and in both it would follow that the concentration of this matter within the orbit of the earth, would effect the separation of day from night, by illuminating alternately the opposite sides of the earth. It is true that the theory of La Place does not provide for any such special condensation of luminous matter, nor for any precise

stage of the process as that in which the arrangements of light and darkness should be completed; but under his hypothesis it seems necessary to account in some such way for the sole luminosity of the sun; and the point of separation of day and night must have been a marked epoch in the history of the process for each planet.

But the Mosaic record and the hypothesis of La Place alike admit of another and somewhat different explanation of the primitive light. For this also I am indebted to Nichol.* After describing the sun's luminous atmosphere with its bright "faculae," its dimmer spaces, and the huge dark spots or cavities that seem to be caused by gigantic whirlwinds similar to our terrestrial hurricanes, but of vastly greater dimensions, he goes on to inquire why the sun possesses the monopoly of light, which on La Place's theory might be shared among the planets, and whether anything similar to the sun's luminous cloud is connected with the planets; and adduces the following facts as evidence of such luminosity in an inferior degree. "Our first thought leads us to the Auroras. Whatever their origin, they show the existence of causes in virtue of whose energy the upper strata of our atmosphere become self-luminous sometimes in a high degree; for in northern regions our travellers have *read* by their brilliance. But the Aurora is not the only phenomenon which indicates the existence of a power in the matter of our globe to emit

* "Planetary System"; also Humboldt, Cosmos, "Northern Lights"; and Wagner and Schubert, quoted by Kurtz.

light. One fact that must have been often noticed, forcibly impresses me with the conviction that here, through what seems common, truths of much import will yet be reached. In the dead of night, when the sky is clear and one is admiring the brilliancy of the stars, hanging over a perfectly obscured earth, a cloud, well known to observing astronomers, will at times begin to form, and it then spreads with astonishing rapidity over the whole heavens. The light of the stars being thus utterly shut out, one might suppose that surrounding objects would, if possible become more indistinct: but no! what was formerly invisible can now be clearly seen; not because of lights from the earth being reflected back from the cloud — for very often there are none—but in virtue of the *light of the cloud itself*, which, however faint, is yet a similitude of the dazzling shell of the sun. The existence of this illuminating power, though apparently in its debilitude, we discover also in appearances among the other orbs. Flashes like our auroras are said to have been observed over the dark hemisphere of Venus; and the obscure part of the moon is believed to have been visited by similar phenomena; but the circumstance most remarkably corroborative of the mysterious truth to which these indications point, is the appearance of our midnight luminary during a total eclipse. By theory she ought to disappear entirely from the heavens. She should vanish, and the sky seem as if no moon were in being; but on the contrary, and even

when she passes the very centre of the earth's shadow, she seems a huge disc of bronze, in which the chief spots can easily be descried by the telescope. It has been put forth in explanation that a portion of the rays of the sun must be reflected by our atmosphere and bent toward the eclipsed disk, from which again they are reflected to the earth—thus giving the moon that bronze colour; but the instant the hypothesis is tested by calculation, we discover its utter insufficiency. Nor is there any tenable conclusion save this:—That the matter both of sun and planets is capable, in certain circumstances, whose exact conditions are not known, of evolving the energy which we term light; and that the atmosphere of the sun is at present under influences favorable to the high manifestation of a power which from the other orbs has not yet entirely departed. And thus for ever is broken down that supposed distinction which seemed to place our central luminary apart in *species*, to an immeasurable extent from the humbler worlds that roll around him." Let us suppose, in accordance with this hypothesis, that our earth was in its earlier state surrounded by a self-luminous atmosphere. This, if sufficiently brilliant, would exclude the light of the sun and of the heavenly bodies; and, as its light became exhausted and that of the sun increased, the latter would gradually be installed into his office as the sole orb of day. It is quite evident that either this last view, or that above explained, would give a sufficient hypothetical explanation of the light of the first of the creative æons; and this is all that in

the present state of science we can expect. "Where is the way where light dwelleth, and as for darkness where is the place thereof, that thou shouldst take it to the bound thereof, and know the way to the house thereof?"

For the reasons above given, we must regard the hypothesis of the great French astronomer, as a wonderful approximation to the grand and simple plan of the construction of our system as revealed in scripture. It is true, however, that since recent improvements in telescopes have resolved into stars those nebulae which were supposed to be instances of world-formation actually in progress, astronomers have very generally abandoned the nebular hypothesis which was one of the foundations of the theory of La Place. But this circumstance does not affect the theory as an illustration of scripture, since whether or not such processes are now in progress, many astronomical facts and the scripture narrative, concur in suggesting that it was in some such method that it pleased the Creator to construct our system.

"God saw the light that it was good," though it illuminated but a waste of lifeless waters. It was good because beautiful in itself, and because God saw it in its relations to long trains of processes and wonderful organic structures on which it was to act as a vivifying agency. Throughout the scriptures light is not only good, but an emblem of higher good. In Psalm civ. God is represented as "clothing himself with light as with a garment"; and in many other parts of these exquisite lyrics we have similar figures.

"The Lord is my light and salvation." "Lift up the light of thy countenance upon me." "The entrance of thy law giveth light." "The path of the just is as a shining light." And the great spiritual light of the world, the "only begotten of the Father," the mediator alike in creation and redemption, is himself the "Sun of Righteousness." Perhaps the noblest scripture passage relating to the blessing of light, is one in the address of Jehovah to Job, which is unfortunately so imperfectly translated in the English version as to be almost unintelligible:—

"Hast thou in thy lifetime given law to the morning,
Or caused the dawn to know its place,
That it may enclose the horizon in its grasp,
And chase the robbers before it:
It rolls along as the seal over the clay,
Causing all things to stand forth in gorgeous apparel."*

Job xxxviii. 12.

* This translation is as literal as is consistent with the bold abruptness of the original. The last idea is that of a cylindrical seal rolling over clay and leaving behind a beautiful impression where all before was a blank. See Barnes, in loc., for a summary of the views of exegists on this passage, the difficulty of which, as in many similar cases, is not so much in the words themselves, as in the want of familiarity of expositors with the images employed.

CHAPTER VII.

DAYS OF CREATION.

GENESIS i. 5: "And God called the light Day; and the darkness he called Night. And the evening and the morning were the first day."

THESE words bring us to the consideration of one of the most difficult problems in this chapter, and one on which its significance in a great measure depends—the meaning of the word *day*, and the length of the days of creation. I am aware that we have the authority of many great names for determining that the days of the creative week must have been literal days; and that the belief that these days were long periods, was in consequence at one time almost entirely abandoned. But after a careful examination of the considerations that have been advanced on both sides of the question, I confess that I must agree with those who think that the point is far from being settled, and that the arguments bearing on it, and more especially those derived from the internal evidences, deserve a farther and very attentive consideration.

In pursuing this investigation, I shall refrain from noticing in detail the views of the many able modern writers who, from Cuvier, De Luc and Jameson, down to Hugh Miller, have maintained the period theory, or those equally numerous and able writers who have supported the opposite

view. I acknowledge obligations to them all, but prefer to direct my attention immediately to the record itself.

The first important fact that strikes us, is one which has not received the attention it deserves, viz: that the word day is evidently used in two senses in the verse itself. We are told that God called the *light*, that is the diurnal continuance of light, day. We are also informed that the *evening* and the *morning* were the first day. Day therefore in one of these clauses is the light as separated from the darkness, which we may call the *natural day;* in the other it is the whole time occupied in the creation of light and its separation from the darkness, whether that was a *civil or astronomical day* of twenty-four hours or some longer period. In other words, the daylight, to which God is represented as restricting the use of the term day, is only a part of a day of creation, which included both light and darkness, and which might be either a civil day or a longer period, but could not be the natural day intervening between sunrise and sunset, which is the *ordinary* day of scripture phraseology.

To pave the way for a right understanding of the day of creation, it may be well to consider, in the first place, the manner in which the *shorter day* is introduced. In the expression "God called the light day," we find for the first time the Creator naming his works, and we may infer that some important purpose was to be served by this. The nature of this purpose we ascertain by comparison with other instances of the same kind, occurring in the chapter.

God called the darkness night, the firmament heaven, the dry land earth, the gathered waters seas. In all these cases the purpose seems to have been one of verbal definition, perhaps along with an assertion of sovereignty. It was necessary to distinguish the diurnal darkness from that unvaried darkness which had been of old, and to discriminate between the limited waters of an earth having dry land on its surface, and those of the ancient universal ocean. This is effected by introducing two new terms, night and seas. In like manner it was necessary to mark the new application of the term earth to the dry land, and that of heaven to the atmosphere, more especially as these were the senses in which the terms were to be popularly used. The intention therefore in all these cases was to affix to certain things names different from those which they had previously borne in the narrative, and to certain terms new senses differing from those in which they had been previously used. Applying this explanation here, it results that the probable reason for calling the light day, is to point out that the word occurs in two senses, and that while it was to be the popular and proper term for the natural day, this sense must be distinguished from its other meaning as a day of creation. In short, we may take this as a plain and authoritative declaration *that the day of creation is not the day of popular speech.* We see in this a striking instance of the general truth that in the simplicity of the structure of this chapter, we find not carelessness but studied and severe precision, and a warning against the neglect of the smallest peculiarities in its diction.

What then is the day of creation, as distinguished by Moses himself from the natural day. The general opinion, and that which at first sight appears most probable, is that it is merely the ordinary civil day of twenty-four hours. Those who adopt this view insist on the impropriety of diverting the word from its usual sense. Unfortunately however for this argument, the word is not very frequently used in the scriptures for the whole twenty-four hours of the earth's revolution. Its etymology gives it the sense of the time of glowing or warmth, and in accordance with this, the Divine authority here limits its meaning to the daylight. Accordingly, throughout the Hebrew scriptures, *yom* is generally the natural and not the civil day; and where the latter is intended, the compound terms "day and night" and "evening and morning," are frequently used. Any one who glances over the word day in a good English concordance, can satisfy himself of this fact. But the sense of natural day from sunrise to sunset, is expressly excluded here by the context, as already shown; and all that we can say in favour of the interpretation that limits the day of creation to twenty-four hours, is that next to the use of the word for the natural day, which is its true popular meaning, its use for the civil day is perhaps the most frequent. It is therefore by no means a statement of the whole truth to affirm, as many writers have done, that the civil day is *the ordinary* meaning of the term. At the same time we may admit that this is *one* of its ordinary meanings, and therefore may be its meaning here. Another argument

frequently urged is, that the day of creation is said to have had an evening and morning. We shall consider this more fully in the sequel, and in the meantime may observe that it appears rather hazardous to attribute an ordinary evening and morning to a day which, on the face of the record, preceded the formation and arrangement of the luminaries which are "for days and for years."*

Admitting then that the civil day *may* be meant, we may now proceed to consider another meaning of the word, very common in scripture, and perhaps occurring as frequently as the instances in which the word can be with certainty maintained to denote the civil day. In the Bible long and undefined periods are indicated by the word day. In many of these cases the word is in the plural; as Gen. iv. 3, "And after days it came to pass," rendered in our version "in process of time," Gen. xl. 4, "days in ward," rendered "a season." Such instances as these are not applicable to the present question, since the plural may have

* Prof. Dana thus sums up the various meanings of the word day in Genesis :—"*First*, in verse 5, the *light* in general is called day, the darkness, night. *Second*, in the same verse, *evening and morning* make the first day, before the sun appears. *Third*, verse 14, day stands for *twelve hours* or the period of daylight, as dependent on the sun. *Fourth*, same verse, in the phrase "days and seasons," day stands for a period of *twenty-four hours*. *Fifth*, at the close of the account, in verse 4, of the second chapter, day means the *whole period of creation*. These uses are the same that we have in our own language."

the sense of indefinite time, merely by denoting an undetermined number of natural days. Passages in which the singular occurs in this sense, are those which strictly apply to the case in hand, and such are by no means rare. A very remarkable example is Genesis ii. 4, where we find "In the day when Jehovah Elohim made the earth and the heavens." This day must either mean the beginning, or must include the whole six days; most probably the latter, since the word "made" refers not to the act of creation, properly so called, but to the elaborating processes of the creative week; and occurring as this does immediately after the narrative of creation, it seems almost like an intentional intimation of the wide import of the creative days. It has been objected however that the expression "in the day" is properly a compound adverb, having the force of "when" or "at the time." But the learned and ingenious authors who urge this objection, have omitted to consider the relative probabilities as to whether the adverbial use had arisen while the word *yom* meant simply a day, or whether the use of the noun for long periods was the reason of the introduction of such an adverbial expression. The probabilities are in favour of the latter, for it is not likely that men would construct an adverb referring to indefinite time from a word denoting one of the most precisely limited portions of time, unless that word had also a second and more unlimited sense. Admitting therefore that the phrase is an adverb of time, its use so early as the date of the composition of Genesis, to denote a period longer than a literal day, seems to imply that this indefinite use of the word

was of high antiquity, and probably preceded the invention of any term by which long periods could be denoted.

This use of the word day is however not limited to cases of the occurrence of the formula "in the day." The following are a few out of many instances that might be quoted. Job xviii. 20: "They that come after him shall be astonished at his day." Job xv. 32: "It shall be accomplished before his *time*." Judges xviii. 30: "Until the day of the captivity of the land." Deut. i. 39: "And your children which in that day had no knowledge of good and evil." Gen. xxxix. 10: "And it came to pass about that time (on that day)." We find also abundance of such expressions as "day of calamity," "day of distress," "day of wrath," "day of God's power," "day of prosperity." In such passages the word is evidently used in the sense of era or period of time, and this in prose as well as poetry.

There is a remarkable passage in the Psalms, which conveys the idea of a day of God as distinct from human or terrestrial days:

"Before the mountains were brought forth,
Or ever thou hadst formed the earth and the world,
Even from everlasting to everlasting, thou art God.
Thou turnest man to destruction,
And sayest, Return, ye children of men;
For a thousand years are in thy sight as yesterday when it is past,
And as a watch in the night."*

* It is worthy of note that this psalm is attributed to Moses, and that it probably refers to the creation and the deluge.

The same thought occurs in the second epistle of Peter: "One day is with the Lord as a thousand years, and a thousand years as one day." These remarkable statements are not expressly intended to give information as to the days of creation. They teach us, however, that in the sight of the Eternal, our measurements of time are as nothing; and that the scripture writers had the idea that God's smallest measures of time might be very long.

But supposing that the inspired writer intended to say that the world was formed in six long periods of time, could not he have used some other word than *yom* that would have been liable to fewer doubts. There are words which might have been used, as for instance *eth*, time, season, or *olam*, age, ancient time, eternity. These words, however, have about them a want of precision as to their beginning and end, which unfits them for this use; and after some search, I have been unable to find any instance which would justify me in affirming that on the supposition that Moses intended long periods, he could have better expressed the idea than by the use of the word *yom*, more especially if he and those to whom he wrote were familiar with the thought, preserved to us in the mythology of the Hindoos, and probably widely diffused in ancient Asia, that a working day of the Creator immeasurably transcends a working day of man.*

* For the benefit of those who may value ancient authorities in such matters, and to show that such views may rationally be entertained independently of geology, I quote the following pas-

Many objections to the view which I have thus endeavoured to support from internal evidence, will at once occur to every intelligent reader familiar with the literature of this subject. I shall now attempt to give the principal of these objections a candid consideration.

(1.) It is objected that the time occupied in the work of creation, is given as a reason for the observance of the seventh day as a sabbath; and that this requires us to view the days of creation as literal days. "For in six days Jehovah made the heaven and the earth, the sea and all that in them is, and rested on the seventh day; therefore Jehovah blessed the sabbath day and sanctified it." The

sage from Origen: "Cuinam quaeso sensum habenti convenienter videbitur dictum, quod dies prima et secunda et tertia, in quibus et vespera nominatur, et mane, fuerint sine sole, et sine luna et sine stellis: prima autem dies sine cœlo." So St. Augustine expressly states his belief that the creative days could not be of the ordinary kind. "Qui dies, cujusmodi sint, aut perdifficile nobis, aut etiam impossibile est cogitare, quanto magis discere." Bede also remarks "fortassis hic diei nomen, totius temporis nomen est, et omnia volumina seculorum hoc vocabulo includit." Many similar opinions of old commentators might be quoted. It is also not unworthy of note that the cardinal number is used here, "one day" for first day; and though the Hebrew grammarians have sought to found on this, and a few similar passages, a rule that the cardinal may be substituted for the ordinal, many learned Hebraists insist that this use of the cardinal number implies singularity and peculiarity as well as mere priority.

argument used here is, however, one of analogy. Because God rested on His seventh day, He blessed and sanctified it, and required men in like manner to sanctify their seventh day.* Now, if it should appear that the working day of God is not the same with the working day of man, and that the sabbath of God is of proportionate length to his working day, the analogy is not weakened; more especially as we find the same analogy extended to the seventh year. If it should be said, God worked in the creation of the world in six long ages and rested on the seventh, therefore man in commemoration of this fact shall sanctify the seventh of his working days, the argument is as strong, the example as intelligible, as on the common supposition. This objection is, in fact, a piece of pedantic hyperorthodoxy which has too long been handed about without investigation. It is refreshing to find it thus crushed in the strong grasp of Hugh Miller:—†

"I cannot avoid thinking that many of our theologians attach a too narrow meaning to the remarkable reason attached to the fourth commandment by the Divine lawgiver. "God rested on the seventh day," says the text, "from all His work which He had created and made; and God blessed the seventh day and sanctified it." And such is

* It is to be observed, however, that on the so called literal day hypothesis, the first sabbath was not man's seventh day, but rather his first, since he must have been created toward the close of the sixth day.

† Footprints of the Creator.

the reason given in the decalogue why man should rest on the sabbath day. God rested on the sabbath day and sanctified it; and therefore man ought also to rest on the sabbath and keep it holy. But I know not where we shall find grounds for the belief that the sabbath day during which God rested was merely commensurate with one of the sabbaths of short lived man—a brief period measured by a single revolution of the earth on its axis. We have not, as has been shown, a shadow of evidence that He resumed his work of creation on the morrow; the geologist finds no trace of post-Adamic creation; the theologian can tell us of none. God's sabbath of rest may still exist; the work of redemption may be the work of his sabbath day. That elevatory process through successive acts of creation, which engaged him during myriads of ages, was of an ordinary week-day character, but when the term of his moral government began, the elevatory process peculiar to it assumed the Divine character of the sabbath. This special view appears to lend peculiar emphasis to the reason embodied in the commandment. The collation of the passage with the geologic record, seems, as if by a species of retranslation, to make it enunciate as its injunction, "Keep this day, not merely as a day of memorial related to a past fact, but also as a day of co-operation with God in the work of elevation, in relation both to a present fact and a future purpose." "God keeps His sabbath" it says "in order that He may save; keep yours also that ye may be saved." It serves besides to throw light on the prominence of the

sabbatical command, in a digest of law of which no jot or tittle can pass away until the fulfilment of all things. During the present dynasty of probation and trial, that special work of both God and man on which the character of the future dynasty depends, is the sabbath day work of saving and being saved."

"The common objection to that special view which regards the days of creation as immensely protracted periods of time, furnishes a specimen, if not of reasoning in a circle, at least of reasoning from a mere assumption. It first takes for granted that the sabbath day during which God rested, was a day of but twenty-four hours, and then argues from the supposition that in order to keep up the proportion between the six previous working days and the seventh day of rest, which the reason annexed to the fourth commandment demands, these previous days must also have been twenty-four hours each. It would, I have begun to suspect, square better with the ascertained facts, and be at least equally in accordance with scripture, to reverse the process, and argue that because God's working days were immensely protracted periods, his sabbath also must be an immensely protracted period. The reason attached to the law of the sabbath, seems to be simply a reason of proportion:—the objection to which I refer is an objection palpably founded on considerations of proportion, and certainly were the reason to be divested of proportion, it would be divested also of its distinctive character as a reason. Were it as follows it could not be at all understood: "Six

days shalt thou labour, &c.; but on the seventh day shalt thou do no labour, &c.; for in six immensely protracted periods of several thousand years each, did the Lord make the heavens and the earth, &c.; and then rested during a brief day of twenty-four hours; therefore the Lord blessed the brief day of twenty-four hours and hallowed it." This I repeat would not be reason. All however that seems necessary to the integrity of the reason, in its character as such, is that the proportion of six parts to seven should be maintained. God's periods may be periods expressed algebraically by letters symbolical of unknown quantities, and man's periods by letters symbolical of quantities well known; but if God's sabbath be equal to one of his six working days, and man's sabbath equal to one of his six working days, the integrity of proportion is maintained."

Not only does this view of the case entirely remove the objection; but it throws a new light on the nature and reason of the sabbath. No good reason, except that of setting an example, can be assigned for God's resting for a literal day. But if God's sabbath of rest from natural creation is still in progress, and if our short sabbaths are symbolical of the work of that great sabbath in its present grey morning and in its coming glorious noon; then may the christian thank this question incidentally raised by geology and its long periods, for a ray of light which shines along the whole course of scripture history, from the first sabbath up

to that final "rest which remaineth for the people of God." *

2. It is objected that evening and morning are ascribed to the first day. This has been already noticed; it may here be considered more fully. The word evening in the original is literally the darkening, the sunset, the dusk. Morning is the *opening* or *breaking forth* of light—the day-break. It must not be denied that the explanation of these terms is attended with some difficulty, but this is not at all lessoned by narrowing the day to twenty-four hours. The first operation of the first day was the creation of light; next we have the Creator contemplating his work and pronouncing it to be good; then we have the separation of the light and darkness, previously it is to be presumed intermixed; and all this without the presence of a sun or other luminary. Which of these operations occupied the evening, and which the morning, if the day consisted of but twenty-four hours, beginning according to Hebrew custom in the evening? Was the old primeval darkness the evening or night, and the first breaking forth of light morning. This is almost the only view compatible with the Hebrew civil day beginning at evening, but it would at once lengthen the day beyond twenty-four hours, and contradict the terms of the record. Again, were the separated light and darkness the morning and evening?

* This idea occurs in Lord Bacon's confession of Faith, and De Luc also maintains that the Creator's sabbath must have been of long continuance.

If so, why is the evening mentioned first, contrary to the supposed facts of the case; why indeed are the evening and morning mentioned at all, since on that supposition this is merely a repetition? Lastly, shall we adopt the ingenious expedient of dividing the evening and morning between two days, and maintaining that the evening belongs to the first and the morning to the second day, which would deprive the first day of a morning, and render the creative days, whatever their length, altogether different from Hebrew natural or civil days. It is unnecessary to pursue such inquiries farther, since it is evident that the terms of the record will not agree with the supposition of natural evening and morning. This is of itself a strong presumption against the hypothesis of civil days, since the writer was under no necessity so to word these verses that they would not give any rational or connected sense on the supposition of natural evening and morning, unless he wished to be otherwise understood.

But what is the meaning of evening and morning, if these days were long periods? Here fewer difficulties meet us. First; It is readily conceivable that the beginning and end of a period named a day should be called evening and morning. But what made the use of these divisions necessary or appropriate? I answer that nature and revelation both give grounds at least to suspect that the evening, or earlier part of each period, was a time of comparative inaction, sometimes even of retrogression, and that the latter part of each period was that of its greatest

activity and perfection. Thus on the views stated in a former chapter, in the first day there was a time when luminous matter, either gradually concentrating itself towards the sun, or surrounding the earth itself, shed a dim but slowly increasing light, then there were day and night, the light increasing in intensity as, toward the end of the period, the luminous ether became more and more concentrated around the sun. So in our own seventh day, the earlier part was a time of deplorable retrogression, and though the sun of righteousness has arisen, we have seen as yet only a dim and cloudy morning. On the theory of days of vision, as expounded by Hugh Miller, in the Testimony of the Rocks, in one of his noblest passages, the evening and night fall on each picture presented to the seer like the curtain of a stage. Secondly; Though the explanation stated above is the most probable, the hypothesis of long periods admits of another, namely, that the writer means to inform us that evening and morning, once established by the separation of light from darkness, continued without cessation throughout the remainder of the period—rolling from this time uninterruptedly around our planet, like the seal cylinder over the clay.* This explanation is, however, less applicable to the following days than to the first. Nor does this accord with the curious fact that the seventh day, which, on the hypothesis of long periods, is still in progress, is not said to have had an evening or morning.

* See the quotation from Job at the close of last chapter.

3. It is objected that the first chapter of Genesis "is not a poem nor a piece of oratorical diction" but a simple prosaic narrative, and consequently that its terms must be taken in a literal sense. In answer to this I urge that the most truly literal sense of the word, namely, the *natural* day, is excluded by the terms of the narrative; and that the word may be received as a literal day of the Creator, in the sense of one of his working periods, without involving the use of poetical diction, and in harmony with the wording of plain prosaic passages in other parts of the Bible. Examples of this have already been given.

4. It has been urged that in cases where day is used to denote period, as in the expressions "day of calamity," &c., the adjuncts plainly show that it cannot mean an ordinary day. In answer to this, I merely refer to the internal evidence already adduced, and to the deliberate character of the statements, in the manner rather of the description of processes than of acts. The difficulties attending the explanation of the evening and the morning, and the successive creation of herbivorous and carnivorous animals, are also strong indications which should serve here to mark the sense, just as the context does in the cases above referred to.

5. In Prof. Hitchcock's valuable and popular "Religion of Geology," I find some additional objections, which deserve notice, as specimens of the learned trifles which pass current among writers on this subject, much to the detriment of sound scriptural literature. I give them in

the words of the author. 1. "From Genesis ii. 5 compared with Genesis i. 11 and 12, it seems that it had not rained on the earth till the third day; a fact altogether probable if the days were of twenty-four hours, but absurd if they were long periods." It strikes us that the absurdity here is all on the side of the short days. Why should any prominence be given to a fact so common as the lapse of two ordinary days without rain, more especially if a region of the earth and not the whole is referred to, and in a document prepared for a people residing in climates such as those of Egypt and Palestine. But what could be more instructive and confirmatory of the truth of the narrative, than the fact that in the two long periods which preceded the formation and clearing up of the atmosphere or firmament, on which rain depends, and the elevation of the dry land, which so greatly modifies its distribution, there had been no rain such as now occurs. This is a most important fact, and one of the marked coincidences of the record with scientific truth. The objection, therefore, merely shows that the ordinary day hypothesis tends to convert one of the finest internal harmonies of this wonderful history, into an empty, and in some respects absurd commonplace. 2. "This hypothesis (that days are long periods) assumes that Moses describes the creation of all the animals and plants that have ever lived on our globe. But geology decides that the species now living, since they are not found in the rocks any lower than man is,* could not have

* This is not strictly correct, as many animals, especially of the lower tribes, extend back to the early tertiary periods, long

been contemporaneous with those in the rocks, but must have been created when man was—that is, in the sixth day. Of such a creation no mention is made in Genesis; the inference is that Moses does not describe the creation of the existing races, but only of those that lived thousands of years earlier, and whose existence was scarcely suspected till modern times. Who will admit such an absurdity?" In answer to this objection, I remark that it is based on a false assumption. The hypothesis of long periods does not require us to assume that Moses notices all the animals and plants that have ever lived, but on the contrary that he informs us only of the *first appearance* of each great natural type in the animal and vegetable kingdoms; just as he informs us of the first appearance of dry land on the third day, but says nothing of the changes which it underwent on subsequent days. Thus plants were created on the third day, and though they may have been several times destroyed and renewed as to genera and species, we infer that they continued to exist in all the succeeding days, though the inspired historian does not inform us of the fact. So also many tribes of animals were created in the early part of the fifth day, and it is quite unnecessary for us to be informed that these tribes continued to exist through the sixth day. If the days were long periods, the inspired writer could not have adopted any other course,

before the creation of man; a fact which of itself is irreconcileable with the Mosaic narrative on the theory of literal or ordinary days.

unless he had been instructed to write a treatise on Palæontology, and to describe the fauna and flora of each successive period with their characteristic differences. 3. "Though there is a general resemblance between the order of creation as described in Genesis and by geology, yet when we look at the details of the creation of the organic world, as required by this hypothesis, we find manifest discrepancy. Thus the Bible represents plants only to have been created on the third day, and animals not till the fifth; and hence at least the lower half of the fossiliferous rocks ought to contain nothing but vegetables. Whereas in fact the lower half of these rocks, all below the carboniferous, although abounding in animals, contain scarcely any plants, and these in the lowest strata fucoids or seaweeds. But the Mosaic account evidently describes flowering and seed-bearing plants, not flowerless and seedless algae. Again, reptiles are described in Genesis as created on the fifth day; but reptilia and batrachians existed as early as the time when the lower carboniferous and even old red sandstone were in course of deposition, as their tracks on those rocks in Nova Scotia and Pennsylvania evince.* In short, if we maintain that Moses describes

* Beside these footprints, bones of a reptile (*Archegosaurus*) have been found in the coal measures of Bavaria. Other reptilian animals (*Dendrerpeton Acadianum* and *Baphetes planiceps*) have been found in the coal formation of Nova Scotia; Batrachian remains have been observed in British coal shales, and in those of Ohio; and the skeleton of a reptile (*Telerpeton*) has been found in the old Red Sandstone of Morayshire.

fossils as well as living species, we find discrepancy instead of correspondence between his order of creation and that of geology." In this objection it is assumed that the geological history of the earth goes back to the third day of creation, or, in other words, to the dawn of organic life. None of the greater authorities in geology would, however, now venture to make such an assertion, and the progress of geology is rapidly making the contrary more and more probable. The fact is, that on the supposition that the days of creation are long periods, the whole series of the fossiliferous rocks belongs to the fifth and sixth days, and that for the early plant creation of the third day, and the great physical changes of the fourth, geology has nothing as yet to show, except a mass of metamorphosed Azoic rocks which have hitherto yielded no fossils.

I have much pleasure in quoting, as a farther answer to these objections, the following from Prof. Dana* : —

"Accepting the account in Genesis as true, the seeming discrepancy between it and geology rests mainly here: geology holds, and has held from the first, that the progress of creation was mainly through secondary causes; for the existence of the science presupposes this. Moses, on the contrary, was thought to sustain the idea of a simple fiat for each step. Grant this first point to science, and what further conflict is there? *The question of the length of time*, it is replied. But not so; for if we may take the

* Biblical Repository, 1856.

record as allowing more than six days of twenty-four hours, the Bible then places no limit to time. *The question of the days and periods*, it is replied again. But this is of little moment in comparison with the first principle granted. Those who admit the length of time and stand upon days of twenty-four hours, have to place geological time *before* the six days, and then assume a chaos and reordering of creation, on the six-day and fiat principle, after a previous creation that had operated for a long period through secondary causes. Others take days as periods, and thus allow the required time, admitting that creation was one in progress, a grand whole, instead of a *first* creation excepting man by one method, and a *second* with man by the other. This is now the remaining question between the theologians and geologists; for all the minor points, as to the exact interpretation of each day, do not affect the general concordance or discordance of the Bible and science.

On this point, geology is now explicit in its decision, and indeed has long been so. It proves that there was no return to choas, no great revolution, that creation was beyond doubt one in its progress. We know that some geologists have taken the other view. But it is only in the capacity of theologians and not as geologists. The Rev. Dr. Buckland, in placing the great events of geology between the first and second verses of the Mosaic account, did not pretend that there was a geological basis for such an hypothesis; and no writer since has ever brought forward the first fact in geology to support the idea of a re-

arrangement just before man;—not one solitary fact has ever been appealed to. The conclusion was on biblical grounds, and not in any sense on geological. The best that Buckland could say, when he wrote twenty-five years since, was, that geology did not absolutely disprove such an hypothesis; and that cannot be said now.*

It is often asserted, in order to unsettle confidence in these particular teachings of geology, that geology is a changing science. In this connection, the remark conveys an erroneous impression. Geology is a progressing science; and all its progress tends to establish more firmly these two principles. (1) The slow progress of creation through secondary causes, as explained; and (2) the progress by periods analogous to the days of Genesis."

I have, I trust, shown that the principal objections to the lengthening of the Mosaic days into great cosmical periods, are of a character too light and superficial to deserve any regard. I shall now endeavour to add to the internal evidence previously given, some considerations of an external character which support this view.

1. The fact that the creation was progressive, that it proceeded from the formation of the raw material of the universe, through successive stages, to the perfection of living organisms, if we regard the analogy of God's operations as disclosed in the geological history of the earth and in the present course of nature, must impress us with

* Appendix B.

a suspicion that long periods were employed in the work. God might have prepared the earth for man in an instant. He did not choose to do so, but on the contrary proceeded step by step, and the record he has given us does not receive its full significance nor attain its full harmony with the course of geological history, unless we can understand each day of the creative week as including a long succession of ages.

2. We have, as already explained, reason to believe that the seventh day at least has been of long duration. At the close of the sixth, God rested from all his work of material creation, and we have as yet no evidence that he has resumed it. With the exception of the author of the "Vestiges of Creation" and a few similar speculators, no one pretends that he has done so. We know that the present day, if it is the seventh, has lasted already for about six thousand years, and, if we may judge from the testimony of prophecy, has yet a long space to run, before it merges in that "new heaven and new earth" for which all believers look, and which will constitute the first day of an endless sabbatism.

3. The philosophical and religious systems of many ancient nations, afford intimations of the somewhat extensive prevalence in ancient times of the notion of long creative periods, corresponding to the Mosaic days. These notions, in so far as they are based on truth, are probably derived from the Mosaic narrative itself, or from the primitive patriarchal documents which perhaps formed the basis of that

narrative. They are, no doubt, all more or less garbled versions, and cannot be recorded as of any authority, but they serve to show what was the interpretation of the document in a very remote antiquity. I have collected from a variety of sources the following examples:

The ancient mythology of Persia appears to have had six creative periods, each apparently of a thousand years, and corresponding very nearly with the Mosaic days. The Chaldeans had a similar but apparently less coherent system.* The Etruscans possessed a history of the creation, somewhat resembling that of the Bible, and representing the creation as occupying six periods of a thousand years each.†

The Egyptians believed that the world had been subject to a series of destructions and renewals, the intervals between which amounted to 120,000 years, or according to other authorities, to 300,000 or 360,000 years. This system of destruction and renewal the Egyptian priests appear to have wrought out into considerable detail, but though important truths may be concealed under their mysterious dogmas, it will not repay us to dwell on the fragments that remain of them. There can be no doubt, however, that at least the basis of the Egyptian cosmogony must have been the common property of all the Hamite nations of which Egypt was the

* Rhode, quoted by McDonald, "Creation and Fall" p. 62; Eusebius, Chron. Arm.

† Suidas, Lexicon,—"Tyrrenia."

greatest and most permanent; and therefore in all probability derived from the ideas of creation which were current not long after the deluge. The Egyptians appear also, as already stated, to have had a physical cosmogony, beginning with a chaos in which heaven and earth were mingled, and from which were evolved fiery matters, which ascended into the heavens, and moist earthy matters which formed the earth and the sea; and from these were produced, by the agency of solar heat, the various animals. The terms of this cosmogony, as it is given by Diodorus Siculus, indicate the belief of long formative periods.*

The Hindoos have a somewhat extended, though, according to the translations, a not very intelligible cosmogony. It plainly, however, asserts long periods of creative work, and is interesting as an ancient cosmogony preserved entire and without transmission through secondary channels. The following is a summary, in so far as I have been able to gather it from the translation of the Institutes of Menu by Sir W. Jones.†

The introduction to the Institutes represents Menu as questioned by the "divine sages" respecting the laws that should regulate all classes or castes. He proceeds to detail the course of creation, stating that the "Self-existing Power,‡ undiscovered, but making this world discernible,

* Diodorus Siculus, B. 1. Prichard, Egypt. Mythol.

† Asiatic Researches.

‡ This name is exactly identical in meaning with the Hebrew Jehovah Elohim.

He whom the mind alone can perceive, whose essence eludes the external senses, who has no visible parts, who exists from eternity, even the soul of all being, whom no being can comprehend, shone forth in person."

After this really exalted view of the Creator, the writer proceeds to state that the Self-existent created the waters, and then an egg from which he himself comes forth as Brahma the forefather of spirits. "The waters are called Nara because they are the production of *Nara* the spirit of God, and since they were his first *Ayana* or place of motion, he thence is named *Narayana* or moving on the waters. In the egg Brahma remained a year, and caused the egg to divide, forming the heaven above and the earth beneath, and the subtil ether, the eight regions and the receptacle of waters between. He then drew forth from the supreme soul, mind with all its powers and properties." The rest of the account appears to be very confused, and I confess to a great extent unintelligible to me. There follows, however, a continuation of the narrative, stating that there is a succession of seven Menus, each of whom produces and supports the earth during his reign. It is in the account of these successive Menus that the following statement respecting the days and years of Brahma occurs.

"A day of the Gods is equal to a year. Four thousand years of the Gods are called a Critya or Satya age. Four ages are an age of the Gods. *One thousand divine ages (equal to more than four millions of human years) are a day of Brahma the Creator.* Seventy-two divine ages

are one manwantara." * * * "The aggregate of four ages they call a divine age, and believe that in every thousand such ages, or in every day of Brahma, fourteen menus are successively invested with the sovereignty of the earth. Each menu they suppose transmits his authority to his sons and grandsons, during a period of seventy-two divine ages, and such a period they call a manwantara. Thirty such days (of the Creator) or calpas, constitute a month of Brahma; twelve such months one of his years, and 100 such years his age, of which they assert that fifty years have elapsed. We are thus, according to the Hindoos, in the first day or calpa of the fifty-first year of Brahma's life, and in the twenty-eighth divine age of the *seventh manwantara* of that day. In the present day of Brahma the first menu was named the Son of the Self-Existent, and by him the institutes of religion and civil duties are said to have been delivered. In his time occurred a new creation called the *Lotos* creation." Of five menus who succeeded him, Sir William could find little but the names, but the accounts of the seventh are very full, and it appears that in his reign the earth was destroyed by a flood. Sir William suggests that the first menu may represent the creation, and that the seventh may be Noah. The name Menu is derived from a root signifying to understand.

In this Hindoo cosmogony we have many points of correspondence with the scripture narrative: for instance, the Self-Existent Creator; the agency of the Son of God

and the Holy Spirit; the absolute creation of matter; the hovering of the Spirit over the primeval waters; the sevenfold division of the creative process; and the idea of days of the Creator of immense duration. If we suppose the day of Brahma in the Hindoo cosmogony, to represent the Mosaic day, then it amounts to no less than 4,320,000 years; or if, with Sir W. Jones, we suppose the Manwantara to represent the Mosaic day, as seems more probable, its duration will be 308,571 years; and the total antiquity of the earth, without counting the undefined "beginning," will be more than two millions of years. It would be folly, however, to suppose that these Hindoo numbers, which are probably purely conjectural, or based on astronomical cycles, make any near approximation to the facts of the case. The Institutes of Menu are probably in their present form not of great antiquity, but there are other Hindoo documents of greater age which maintain similar views, and it is probable that the account of the creation in the institutes is at least an imperfect version of the original narrative, as it existed among the earliest colonists of India.* It corresponds in many points with the oldest notions on these subjects that remain to us in the wrecks of the mythology of Egypt and other ancient

* The theology of the Institutes is clearly primitive Semitic in its character; and therefore, if the Bible is true, must be older than the Arian theogony of the Rig Veda, as expounded by Muller, whatever the relative age of the documents. See Appendix K.

nations, and it aids in proving that the fabulous ages of gods and demi-gods in the ancient mythologies, *are really pre-adamite;* and belong not to human history, but to the work of creation. It also shows that the idea of long creative periods as equivalents of the Mosaic days, must, in the infancy of the post-diluvian world, have been very widely diffused. Such evidence is, no doubt, of small authority in the interpretation of scripture; but it must be admitted that serious consideration is due to a method of interpretation which thus tends to bring the Mosaic account into harmony with the facts of modern science, and with the belief of almost universal antiquity, and at the same time gives it its fullest significance and most perfect internal symmetry of parts. It is also very interesting to note the wide diffusion among the most ancient nations, of cosmological views identical in their main features with those of the Bible, proving, almost beyond doubt, that these views had some common and very ancient source, and commanded universal belief among the primitive tribes of men.

I have hitherto avoided all detailed reference to what may be regarded as the "prophetic day" view of the narrative of creation. This may be shortly stated as follows:—In the prophetical parts of scripture the prophet sees in vision, as in a picture or acted scene, the events that are to come to pass, and in consequence represents years or longer periods by days of vision. Now the revelation of the pre-adamite past is in its nature akin to that of the unknown.

future; and Moses may have seen these wondrous events in vision—in visions of successive days—under the guise of which he presents geological time. Some things in the form of the narrative favour this view, but I do not regard it as necessary to the interpretation maintained above, nor do I regard the reasons advanced by Kurtz,* and by the author of the excellent little work, the "Harmony of the Mosaic and Geological Records," as at all conclusive.† Yet this theory is conformable to scriptural analogy, and affords a useful aid to many minds in apprehending the nature of the Mosaic narrative. It cannot be put more vigorously than by Miller in his Testimony of the Rocks, to which I beg to refer the reader.

In reviewing the somewhat lengthy train of reasoning into which the term day has led us, it appears that from internal evidence alone, it can be rendered probable that the day of creation is neither the natural nor the civil day. It also appears that the objections urged against the doctrine of day-periods are of no weight when properly scrutinised, and that it harmonises with the progressive nature of the work, the evidence of geology, and the cosmological notions of ancient nations. I do not suppose that this position has been incontrovertibly established; but I believe that every serious difficulty has been removed from its acceptance; and with this, for the present, I remain satis-

* "The Bible and Astronomy," a work full of valuable and suggestive thought.

† Constable, Edinburgh.

fied. Every step of our subsequent progress in interpreting the chapter, will afford new criteria of its truth or fallacy.

The events of the first day may be summed up as follows:—"At the beginning of the period, the earth, covered with a universal ocean and misty atmospheric mantle, was involved in perfect darkness. A luminous ether was called into existence, which spread a diffused light throughout the whole solar system. This luminous matter being gradually concentrated toward the centre of the system, at length produced, in connection with the earth's rotation, the alternation of day and night. These changes were the work of a long period of time, an æon or day of the Creator."

CHAPTER VIII.

THE ATMOSPHERE.

Genesis i. 6 to 8: "And God said let there be an expanse between the waters; and let it separate the waters from the waters. And God made the expanse, and separated the waters which are under the expanse from the waters which are over the expanse, and it was so; and God called the expanse Heaven; and the evening and the morning were the second day."

At the opening of the period to which we are now introduced, the earth was covered by the waters, and these were in such a condition that there was no distinction between the seas and the clouds. No atmosphere separated them, or, in other words, dense fogs and mists everywhere rested on the surface of the primeval ocean. To understand as far as possible the precise condition of the earth's surface at this period, it will be necessary to notice the present constitution of the atmosphere, especially in its relations to aqueous vapour.

The regular and constant constituents of the atmosphere are the elements Oxygen and Nitrogen, which, at the temperature and pressure existing on the surface of our globe, are permanently aeriform or gaseous. Beside these gases, the air always contains a quantity of the vapour of water, in a perfectly aeriform and transparent condition. This vapour is

not, however, permanently gaseous. At all temperatures below 212 degrees, it tends to the liquid state; and its elastic force, which preserves its particles in the separated state of vapour, increases or diminishes at a more rapid rate than the increase or diminution of temperature. Hence the quantity of vapour that can be suspended in clear air, depends on the temperature of the air itself. As the temperature of the air rises, its power of sustaining vapour increases more rapidly than its temperature; and as the temperature of the air falls, the elastic force of its contained vapour diminishes in a greater ratio, until it can exist as an invisible vapour no longer, but becomes condensed into minute bubbles or globules, forming cloud, mist or rain. Two other circumstances operate along with these properties of air and vapour. The heat radiated from the earth's surface causes the lower strata of air to be, in ordinary circumstances, warmer than the higher; and, on the other hand, warm air, being lighter than that which is colder, the warm layer of air at the surface continually tends to rise through and above the colder currents immediately over it. Let us consider the operation of the causes thus roughly sketched, in a column of calm air. The lower portion becomes warmed, and if in contact with water takes up a quantity of its vapour proportioned to the temperature, or, in ordinary circumstances, somewhat less than this proportion. It then tends to ascend, and as it rises and becomes mixed with colder air, it gradually loses its power of sustaining moisture, and at a height

proportioned to the diminution of temperature and the quantity of vapour originally contained in the air, it begins to part with water, which becomes condensed in the form of mist or cloud; and the surface at which this precipitation takes place, is often still more distinctly marked, when two masses or layers of air, at different temperatures, become intermixed; in which case, on the principle already stated, the mean temperature produced is unable to sustain the vapour proper to the two extremes, and moisture is precipitated. It thus happens that layers of cloud accumulate in the atmosphere, while between them and the surface, there is a stratum of clear air. Fogs and mists are in the present state of nature exceptional appearances, depending generally on local causes, and showing what the world might be, but for that balancing of temperature and the elastic force of vapour, which constitutes the atmospheric firmament.*

The quantity of water thus suspended over the earth is enormous. "When we see a cloud resolve itself into rain and pour out thousands of gallons of water we cannot comprehend how it can float in the atmosphere."† The explanation is—1st the extreme levity of the minute globules, which causes them to fall very slowly; 2nd they are

* Daniell's Meteorological Essays; Prout's Bridgewater Treatise; Art. Meteorology Encyc. Brit; Maury's Physical Geography of the Sea.

† Kaemtz, Course of Meteorology.

supported by currents of air, especially by the ascending currents developed both in still air and in storms; 3rdly clouds are often dissolving on one side and forming at another. A cloud gradually descending may be dissolving away by evaporation at the base as fast as new matter is being added above. On the other hand an ascending warm current of air may be constantly depositing moisture at the base of the cloud, and this may be evaporating under the solar rays above. In this case a cloud is "merely the visible form of an aerial space in which certain processes are at the moment in equilibrium, and all the particles in a state of upward movement."* But so soon as condensation markedly exceeds evaporation, rain falls, and the atmosphere discharges its vast load of water—how vast, we may gather from the fact that the waters of all the rivers are but a part of the overflowings of the great atmospheric reservoir. "God binds up the waters in his thick cloud, and the cloud is not rent under them." It is thus that the terrestrial waters are divided into those above and those below that expanse of clear air in which we live and move, exempt from the dense dark mists of the earth's earlier state, yet enjoying the benefits of the cloudy curtain that veils the burning sun, and of the cloudy reservoirs that drop down rain to nourish every green thing.

We have no reason to suppose that the laws which regulate mixtures of gases and vapours did not prevail in the

* Encyc, Brit. Art. Meteorology.

period in question. It is probable that these laws are as old as the creation of matter; but the condition of our earth up to the second day, must have been such as prevented them from operating as at present. Such a condition might possibly be the result of an excessive evaporation occasioned by internal heat. The interior of the earth still remains in a heated state, and includes large subterranean reservoirs of melted rock, as is proved by the increase of temperature in deep mines and borings, and by the widely extended phenomena of hot springs and volcanic action. At this period, the internal temperature of the earth was probably vastly greater than at present, and perhaps the whole interior of the globe may have been in a state of igneous fluidity. At the same time the external solid crust may have been thin, and it was not fractured and thickened in places by the upheaval of mountain chains or the deposition of great and unequal sheets of sediment; for, as I may again remind the reader, the primitive chaos did not consist of a confused accumulation of rocky masses, but the earth's crust must then have been more smooth and unbroken than at any subsequent period. This being the internal condition of the earth, it is quite conceivable, without any violation of the existing laws of nature, that the waters of the ocean, warmed by internal heat, may have sent up a sufficient quantity of vapour to keep the lower strata of air in a constant state of saturation, and to occasion an equally constant precipitation of moisture from the colder strata above. This would merely be

the universal operation of a cause similar to that which now produces fogs at the northern limit of the Atlantic Gulf Stream, and in other localities where currents of warm water flow under or near to cooler air. Such a state of things is more conceivable in a globe covered with water, and consequently destitute of the dry and powerfully radiating surfaces which land presents, and receiving from without the rays, not of a solar orb, but of a comparatively feeble and diffused luminous ether. The continued action of these causes would gradually cool the earth's crust and its incumbent waters, until the heat from without preponderated over that from within, when the result stated in the text would be effected.

The statements of our primitive authority for this condition of the earth, might also be accounted for on the supposition that the permanently gaseous part of the atmosphere did not, at the period in question, exist in its present state, but that it was on the second day actually elaborated and caused to take its place in separating the atmospheric from the oceanic waters. The first is by far the more probable view; but we may still apply to such speculations the words of Elihu, the friend of Job:

"Stand still and consider the wonderful works of God.
Dost thou know when God disposes them,
And the lightning of his cloud shines forth?
Dost thou know the poising of the dark clouds,
The wonderful works of the Perfect in knowledge?

We may now consider the words in which this great improvement in the condition of the earth is recorded. The Hebrew term for the atmosphere is *Rakiah*, literally something expanded or beaten out—an expanse. It is rendered in our version "firmament," and in the Septuagint "*Stereoma*," a word having the same meaning. The idea conveyed by the Hebrew word is not however that of *strength* but of *extent;* or as Milton, the most accurate of expositors of these words, has it—

> "The firmament, expanse of liquid, pure,
> Transparent, elemental air, diffused
> In circuit to the uttermost convex
> Of this great round."

That this was really the way in which this word was understood by the Hebrews, appears from several passages of the Bible. Job says of God, "Who alone *spreadeth* out the heavens."* David in the 104th psalm, which is a poetical paraphrase of the history of creation, speaks of the Creator as "*stretching* out the heavens as a curtain." In later writers, as Isaiah, Jeremiah, Ezekiel, similar expressions occur. The notion of a solid or arched firmament was probably altogether remote from the minds of these writers. Such beliefs may

* It is not meant that the word Rakiah occurs in these passages, but to shew how by other words the idea of stretching out or extension rather than solidity is implied. The verb in the two first passages is Nata to spread out.

have prevailed at the time when the septuagint translation was made, but I have no hesitation in affirming that no trace of them can be found in the Old Testament. In proof of this, I may refer to some of the passages which have been cited as affording the strongest instances of this kind of "accommodation." In Exodus xxiv. 10 we are told, "And they saw the God of Israel, and under his feet as it were a paved work of sapphire and as it were the heaven itself in its clearness." This is evidently a comparison of the pavement seen under the feet of Jehovah to a sapphire in its colour, and to the heavens in its transparency. The intention of the writer is not to give information respecting the heavens, or to liken them either to a pavement or a sapphire; all that we can infer is that he believed the heavens to be clear or transparent. Job mentions the "pillars of heaven," but the connection shows that this is merely a poetical expression for lofty mountains. The earthquake causes these pillars of heaven to "tremble." We are informed in the book of Job that God "ties up his waters in his thick cloud and the cloud is not rent under them." We are also told of the "treasures of snow and the treasures of hail" and rain is called the "bottles of heaven," and is said to be poured out of the "lattices of heaven." I recognise in all these mere poetical figures, not intended to be literally understood. A late learned writer wishes us to believe that the intention of the Bible in these places is actually to teach that the clouds are contained in skin bottles or something similar, and that they are emptied

through hatches in a solid firmament. To found such a belief, however, on a few figurative statements, seems ridiculous, especially when we consider that the writers of the scripture show themselves to be well acquainted with nature, and would not be likely on any account to deviate so far from the ordinary testimony of the senses; more especially as by doing so, they would enable every unlettered man who has seen a cloud gather on a mountain's brow, or dissolve away before increasing heat, to oppose the evidence of his senses to their statements, and perhaps to reject them with scorn as a barefaced imposture. But lastly, we are triumphantly directed to the question of Elihu in his address to Job:

> "Hast thou with him stretched out the sky
> Which is firm and like a molten mirror?"

But the word translated sky here is not "*Rakiah*" or "*Shamayim*," but another signifying the *clouds*, so that we should regard Elihu as speaking of the apparent firmness or stability, and the beautiful reflected tints of the clouds. His words may be paraphrased thus: "Hast thou aided Him in spreading out those clouds which appear so stable and self-sustaining, and so beautifully reflect the sunlight."* The above passages form the only authority which I can find in the scriptures for the doctrine of a solid firmament, which may therefore be characterised as a modern figment of men more learned in books but less

* See also Humboldt, Cosmos, Vol. 2, Pt. I.

acquainted with nature than the scripture writers. As a contrast to all such doctrines I may quote the sublime opening of the poetical account of creation in Psalm 104, where the writer thus addresses the Almighty:

"Bless the Lord, O my soul!
O Lord, my God, thou art very great:
Thou art clothed with honour and majesty,
Who coverest thyself with light as with a garment,
Who stretchest out the heavens like a curtain (of a tent,)
Who layest the beams of thy chambers in the waters,
Who makest the clouds thy chariots,
Who walkest upon the wings of the wind."

The waters here are those above the firmament, the whole of this part of the psalm being occupied with the heavens; and there is no place left for the solid firmament, of which the writer evidently knew nothing. He represents God as laying His chambers on the waters, instead of on the supposed firmament, and as careering in cloudy chariots on the wings of the wind, instead of over a solid arch. For all the above reasons we conclude that the "expanse" of the verses under consideration was understood by the writers of the book of God to be *aerial*, not *solid*, and the "establishment of the clouds above," as it is finely called in Proverbs, is the effect of those meteorological laws to which I have already referred, and which were now for the first time brought into operation by the Divine Legislator, The Hebrew theology was not of a kind to require such expedients as that of solid heavenly arches; it recurred at

once to the will—the decree—of Jehovah; and was content to believe that through this efficient cause the "rivers run into the sea, yet the sea is not full," for "to the place whence the rivers came thither they return again," through the agency of those floating clouds, "the waters above the heavens," which "pour down rain according to the vapour thereof."

God called the expanse "Heavens." In former chapters we have noticed that heaven in the popular speech of the Hebrews, as in our own, had different meanings, applying alike to the cloudy, the astral and the spiritual heavens. The Creator here sanctions its application to the aerial expanse; and accordingly throughout the scriptures it is used in this way; *rakiah* occurs very rarely, as if it had become nearly obsolete, or was perhaps regarded as a merely technical or descriptive term. The divine sanction for the use of the term heaven for the atmosphere, is as already explained, to indicate that this popular use is not to interfere with its application to the whole universe beyond our earth, in verse 1st.

The poetical parts of the Bible, and especially the Book of Job, which is probably the most ancient of the whole, abound in references to the atmosphere and its phenomena. I may quote a few of these passages, to enable us to understand the views of these subjects given in the Bible, and the meaning attached to the creation of the atmosphere, in very ancient periods. In Job, 38th chapter, we have the following:

"In what way is the lightning distributed,
And how is the East wind spread abroad over the earth?
Who hath opened a channel for the pouring rain,
Or a way for the thunder-flash?
To cause it to rain on the land where no man is,
In the desert where no one dwells;
To saturate the desolate and waste ground,
And to cause the bud of the tender herb to spring forth."

Here we have the unequal and unforeseen distribution of thunder storms, beyond the knowledge and power of man, but under the absolute control of God, and designed by him for beneficent purposes. Equally fine are some of the following lines:

"Dost thou lift up thy voice to the clouds,
That abundance of waters may cover thee?
Dost thou send forth the lightnings, and they go,
And say unto thee, here are we?
Who can number the clouds by wisdom,
Or cause the bottles of heaven to empty themselves?
When the dust groweth into mire,
And the clods cleave fast together?"

In the 36th and 37th chapters of the same book, we have a grand description of atmospheric changes in their relation to man and his works. The speaker is Elihu, who in this ancient book most favourably represents the knowledge of nature that existed at a time probably anterior to the age of Moses—a knowledge far superior to that which we find in the works of many modern poets and ex-

positors, and accompanied by an intense appreciation of the grandeur and beauty of natural objects.

"For he draweth up the drops of water,
Rain is condensed* from his vapour,
Which the clouds do drop,
And distil upon man abundantly.
Yea, can any understand the distribution of the clouds
Or the thundering of his tabernacle.†
Behold he spreadeth his lightning upon it,
He covereth it as with the depths of the sea.
By these he executes judgment on the people,
By these also he giveth food in abundance;
His hands he covers with the lightning,
And commands it (against the enemy) in its striking;
He uttereth to it his decree,‡
Concerning the herd as well as proud man.
At this also my heart trembles,
And bounds out of its place;
Hear attentively the thunder of his voice,
And the loud sound that goes from his mouth.
He directs it under the whole heavens,
And his lightning to the ends of the earth.
After it his voice roareth,

* Heb., "they refine."

† "His pavilion round about him was dark waters and thick clouds of the skies," Ps. xviii. This expression explains that in the text.

‡ Translation of these lines much disputed and very difficult. Gesenius and Conant render it—"His thunder tells of him; to the herds even of Him who is on high."

He thundereth with the voice of his majesty;
And delays not (the tempest) when his voice is heard.
God thundereth marvellously with his voice,
He doeth wonders which we cannot comprehend;
For he saith to the snow be thou on the earth.
Also to the pouring rain, even the great rain of his might.
He sealeth up the hand of every man,
That all men may know his work.
Then the beasts go to their dens,
And remain in their caverns.
Out of the south cometh the whirlwind
And cold out of the north,
By the breath of God the frost is produced
And the breadth of waters becomes straitened;
With moisture he loads the thick cloud,
He spreads the cloud of his lightning,
And it is turned about by his direction,
To execute his pleasure on the face of the world;
Whether for correction, for his land, or for mercy,
He causeth it to come.
Hearken unto this, O Job,
Stand still and consider the wonderful works of God.
Dost thou know when God disposes these things,
And the lightning of his cloud flashes forth?
Dost thou know the poising of the clouds,
The wonderful works of the Perfect in knowledge?
When thy garments become warm
When he quieteth the earth by the south wind;
Hast thou with him spread out the clouds
Firm and like a molten mirror?"§

§ I take advantage of this long quotation to state that in the case of this and other passages quoted from the Old Testament,

It would not be easy to find, in the poetry of any nation or time, a description of so many natural phenomena, so fine in feeling or truthful in delineation. It should go far to dispel the too prevalent ideas of early oriental ignorance, and should lead to a more full appreciation of these noble pictures of nature, unsurpassed in the literature of any people or time. I trust that the previous illustrations are sufficient to show, not only that the *stereoma*, or solid firmament of the septuagint, is not to be found in scripture, but that the positive doctrine of the Bible on the subject is of a very different character. For instance, in the above extract from the book of Job, Elihu speaks of the poising or suspension of the clouds as inscrutable, and tells us that God draws up water into the clouds and pours down rain according to the vapour thereof; he also speaks of the clouds as being scattered before the brightness of the sun; and notices, in truthful as well as exalted language, the nature and succession of the lightning's flash, the thunder, and the precipitation of rain that follows. Solomon also informs us that the "establishment of the clouds

I have carefully consulted the original; but have availed myself freely of the renderings of such of the numerous versions and commentaries as I have been able to obtain, whenever they appeared accurate and expressive, and have not scrupled occasionally to give a free translation where this seemed necessary to perspicuity. In the Book of Job, I have consulted principally the translation appended to Barnes's Commentary, and have derived some hints, while the work was going through press, from Dr. Conant's new translation, New York, 1857.

above" is due to the law or will of Jehovah. Finally, in this connection, the Divine sanction given to the use of the term heaven for the atmosphere, may in itself be regarded as an intimation that no definite barrier separates our film of atmosphere from the boundless abyss of heaven without.

Of this period natural science gives us no intimation. In the earliest geological epochs, organic life, dry land, and an atmosphere, already existed. At the period now under consideration, the two former had not been called into existence, and the latter was in process of elaboration from the materials of the primeval deep. If the formation of the atmosphere in its existing conditions was, as already hinted, a result of the gradual cooling of the earth, then this period must have been of great length, and the action of the heated waters on the crust of the globe may have produced thick layers of detrital matter destined to form the first soils of the succeeding æon.* We know nothing, however, of these primitive strata, and most of them must have been removed by denuding agencies in succeeding periods, or restored by subterranean heat to the crystalline state. The events and results of this day may be summed up as follows:—

"At the commencement of the period, the earth was enveloped by a misty or vaporous mantle. In its progress, those relations of air and vapour which cause the separa-

* Appendix C.

tion of the clouds from the earth by a layer of clear air, and the varied alternations of sunshine and rain, were established. At the close of the period, the newly-formed atmosphere covered a universal ocean; and there was probably a very regular and uniform condition of the atmospheric currents, and of the processes of evaporation and condensation."

CHAPTER IX.

THE DRY LAND.

GENESIS i. 10: "And God said, let the waters under the heavens be gathered into one place, and let the dry land appear and it was so. And God called the dry land earth, and the gathering of waters called he seas; and God saw that it was good."

THESE are events sufficiently simple and intelligible in their general character. Geology shows us that the emergence of the dry land must have resulted from the elevation of parts of the bed of the ancient universal ocean, and that the agent employed in such changes is the internal igneous or volcanic energy of the earth, developed in its gradual cooling, and operating either in a slow and regular manner, or by sudden paroxysms. It farther informs us that the existing continents consist of stratified or bedded masses, more or less inclined, fissured and irregularly elevated, and usually supported by crystalline rocks which have been forced up beneath or through them by internal agencies, and which truly constitute the pillars and foundations of the earth. These elevations, it is true, were successive, and belong to different periods; but the appearance of the first dry land is that intended here.

The elevation of the dry land is more frequently referred to in scripture than any other cosmological fact; and while all have been misapprehended, the statements on this subject have been even more unjustly dealt with than others·

In the text, the word (*aretz*)* earth, is by divine sanction narrowed in meaning to the dry land; but, while some expositors are quite willing to restrict it to this, or even a more limited sense, in the first and second verses of this chapter, almost the only verses in the Bible where the terms of the narrative make such a restriction inadmissible, they are equally ready to understand it as meaning the whole globe, in places where the explanatory clause in the verse now under consideration, teaches us that we should understand the land only as distinguished from the sea. I may quote some of these passages, and note the views they give; always bearing in mind that, after the intimation in this verse, we must understand the term earth as applying *only to the continents or dry land*, unless where the context otherwise fixes the meaning. We may first turn to Psalm civ. :—

"Thou laidst the foundations of the earth,
That it should never be removed;
Thou coveredst it with the deep as with a garment;
The waters stood above the mountains;
At thy rebuke they fled;
At the sound of thy thunder they hasted away;
Mountains ascended, valleys descended
To the place thou hast appointed for them:
Thou hast appointed them bounds that they may not pass,
That they return not again to cover the earth."

* The word is one of those that pervade both Semitic and Indo-European tongues. Sanscrit, *ahara;* Pehlevi, *arta;* Latin, *terra;* German, *erde;* Gothic, *airtha;* Scottish, *yird;* English, *earth.*—(Gesenius.)

The position of these verses in this "the hymn of creation" leaves no doubt that they refer to the events we are now considering. I have given above the literal reading of the line that refers to the elevation of mountains and subsidence of valleys; admitting, however, that the grammatical construction gives an air of probability to the rendering in our version, "they go up by the mountains, they go down by the valleys"; which, on the other hand, is rendered very improbable by the sense. In whichever sense we understand this line, the picture presented to us by the psalmist includes the elevation of the mountains and continents, the subsidence of the waters into their depressed basins, and the firm establishment of the dry land on its rocky foundations, the whole accompanied by a feature not noticed in Genesis—the voice of God's thunder —or, in other words, electrical and volcanic explosions. The following passages refer to the same subject:—

"Before the mountains were settled,
Before the hills was I (The Wisdom of God) brought forth;
While as yet he had not made the earth,
Nor the plains, nor the higher parts of the habitable world.
When he gave the sea his decree
That the waters should not pass his limits,
When he determined the foundations of the earth."

Proverbs viii. 20.

"Thou hast established the earth and it endureth,
According to thy decrees they continue this day,
For all are thy servants." *Psalm* cxix. 20.

"Who shaketh the earth out of its place
And its pillars tremble." *Job* ix. 5.

"Where wast thou when I founded the earth?
Declare if thou hast knowledge,
Who hath fixed the proportion thereof, if thou knowest,
Who stretched the line upon it,
Upon what are its foundations settled,
Or who laid its corner stone,
When the morning stars sang together,
And all the sons of God shouted for joy,
Who shut up the sea with doors
In its bursting forth as from the womb,
When I made the cloud its garment
And swathed it in thick darkness?
I measured out for it my limit
And fixed its bars and doors;
And said thus far shalt thou come, but no farther,
And here shall thy proud waves be stayed."—*Job* 38. 4.

In these passages the foundation of the earth at first, as well as the shaking of its pillars by the earthquake, are connected with what we usually call natural law—the decree of the Almighty—the unchanging arrangements of an unchangeable Creator, whose "hands formed the dry land."* This is the ultimate cause not only of the elevation of the land, but of all other natural things and processes. The naturalist does not require to be informed that the details, in so far as they are referred to in the above passages, are perfectly in accordance with what we know of the nature

* Psalm xcv.

and support of continental masses. Geological observation and mathematical calculation have in our day combined their powers to give clear views of the manner in which the fractured strata of the earth are wedged and arched together, and supported by internal igneous masses upheaved from beneath, and subsequently cooled and hardened. A general view of these facts which we have learned from scientific inquiry, the Hebrews gleaned with nearly as much precision from the short account of the elevation of the land in Genesis, and from the later comments of their inspired poets. From the same source our own great poet learned these cosmical facts, before the rise of geology, and expressed them in unexceptionable terms:

> "The mountains huge appear
> Emergent, and their broad bare backs upheave
> Into the clouds, their tops ascend the sky.
> So high as heaved the tumid hills, so low
> Down sunk a hollow bottom, broad and deep
> Capacious bed of waters."

In further illustration of the opinions of the scripture writers respecting the nature of the earth, and the disturbances to which it is liable, I quote the following passages. The first is from that magnificent description of Jehovah descending to succour his people amid the terrors of the earthquake, the volcano, and the thunder storm, in Psalm 18th:

"Then shook and trembled the earth,
The foundations of the hills moved and were shaken,
Because he was angry.
Smoke went up from his nostrils,
Fire from his mouth devoured,
Coals were kindled by it.
Then were seen the channels of the waters,
And the foundations of the world were discovered,
At thy rebuke—O Jehovah—
At the blast of the breath of thy nostrils."

In another passage in the psalms we find volcanic action thus briefly sketched:

"He looketh on the earth and it trembleth,
He toucheth the hills and they smoke.

Psalm civ. 32.

Perhaps the most remarkable passage on this subject in the whole Bible is that in Job 28th, in which mining operations are introduced as an illustration of the difficulty of obtaining true wisdom. This passage is interesting both from its extreme antiquity, and the advancement in knowledge and practical skill which it indicates. It presents, however, many difficulties; and its details have almost entirely lost their true significance in our common English version:—

"Surely there is a vein for silver,
And a place for the gold which men refine;
Iron is taken from the earth,
And copper is molten from the ore.

To the end of darkness and to all extremes man searcheth,
For the stones of darkness and the shadow of death.
He opens a passage (shaft) from where men dwell,
Unsupported by the foot, they hang down and swing to and fro.*
The earth—out of it cometh bread;
And beneath, it is overturned as by fire.†
Its stones are the place of sapphires,
And it hath lumps‡ of gold.
The path (thereto) the bird of prey hath not known,
The vulture's eye hath not seen it.§
The wild beasts' whelps have not trodden it,
The lion hath not passed over it.
Man layeth his hand on the hard rock,
He turneth up the mountains from their roots,
He cutteth channels in the rocks,
His eye seeth every precious thing.
He restraineth the streams from trickling,
And bringeth the hidden thing to light.
But where shall wisdom be found,
And where is the place of understanding?"

This passage, incidentally introduced, gives us a glimpse of the knowledge of the interior of the earth and its pro-

* Gesenius.

† Perhaps "changed," metamorphosed, as by fire. Conant has "destroyed."

‡ "Dust" in our version, literally lumps or "nuggets."

§ The vulgar and incorrect idea, that the vulture "scents the carrion from afar," so often reproduced by later poets, has no place in the Bible poetry. It is the bird's keen eye that enables him to find his prey.

ducts, as it existed in an age anterior to that of Moses. It brings before us the repositories of the valuable metals and gems,—the mining operations, apparently of some magnitude and difficulty, undertaken in extracting them,—and the wonderful structure of the earth itself, green and productive at the surface, rich in precious minerals beneath, and deeper still the abode of intense subterranean fires. The only thing wanting to give completeness to the picture, is some mention of the fossil remains buried in the earth; and, as the main thought is the eager and successful search for useful minerals, this can hardly be regarded as a defect. The application of all this is finer than almost anything else in didactic poetry. Man can explore depths of the earth inaccessible to all other creatures, and extract thence treasures of inestimable value; yet, after thus exhausting all the natural riches of the earth, he too often lacks that highest wisdom which alone can fit him for the true ends of his spiritual being. How true is all this, even in our own wonder-working days! A poet of to-day could scarcely say more of subterranean wonders, or say it more truthfully and beautifully; nor could he arrive at a conclusion more pregnant with the highest philosophy than the closing words:—

> "The fear of the Lord, that is wisdom;
> And to depart from evil is understanding."

The emergence of the dry land is followed by a repetition of the approval of the Creator. "God saw that it was good." To our view, that primeval dry land would

scarcely have seemed good. It was a world of bare, rocky peaks, and verdureless valleys;—here active volcanoes, with their heaps of scoriae and scarcely cooled lava currents;—there vast mud-flats, recently upheaved from the bottom of the waters;—nowhere even a blade of grass, or a clinging lichen. Yet it was good in the view of its Maker, who could see it in relation to the uses for which he had made it, and as a fit preparatory step to the new wonders he was soon to introduce. Then too, as we are informed in Job xxxviii., "The morning stars sang together, and all the sons of God shouted for joy." We also, when we think of the beautiful variety of the terrestrial surface, the character and composition of its soils, the variety of climate and exposure resulting from its degrees of elevation, the arrangements for the continuance of springs and streams, and many other beneficial provisions connected with the merely mechanical arrangements of the dry land, may well join in the tribute of praise to the All-wise Creator. There is, however, a farther thought suggested by the approval of the great Artificer. In this wondrous progress of creation, it seems as if everything at first was in its best estate. No succeeding state could parallel the unbroken symmetry of the earth in the fluid and vaporous condition of the "deep." Before the elevation of the land, the atmospheric currents and the deposition of moisture must have been surpassingly regular. The first dry land may have presented crags, and peaks, and ravines, and volcanic cones, in a more marvellous and perfect manner

than any succeeding continents,—even as the dry and barren moon now, in this respect, far surpasses the earth. In the progress of organic life, geology gives similar indications, in the variety and magnitude of many animal types on their first introduction; so that this may very possibly be a law of creation.

During the emergence of the first dry land, large quantities of detrital matter must have been deposited in the waters, and in part elevated into land. All of these beds would, of course, be destitute of organic remains; and it i possible that some of them might yet be identified There is, in fact, a series of non-fossiliferous rocks (the Azoic) mostly in a metamorphic state, and regarded as older than the oldest fossiliferous strata. It is, however, at present impossible certainly to separate beds which may have been deposited at this period, from those which were deposited after the creation of the first organised beings, since all traces of these may have been obliterated by metamorphism.

Modern analogy would induce us to believe that the land was not elevated suddenly; but either by a series of small paroxysms, as in the case of Chili, or by a gradual and imperceptible movement, as in the case of Sweden,—two of the most remarkable modern instances of elevation of land,—accompanied, however, in the case of the last, by local subsidence.* In either of these ways, the sea and

* Lyell's Principles of Geology.

rivers would have time to smooth the more rugged inequalities, to widen the ravines into valleys, and to spread out sediment in the lower grounds; thus fitting the surface for the habitation of plants and animals. We must not suppose, however, that the dry land had any close resemblance to that now existing, in its form or distribution. Geology amply proves that since the first appearance of dry land, its contour has frequently been changed, and probably also its position. Hence, nearly all our present land consists of rocks which have been formed under the waters, long after the period now under consideration, and have been subsequently hardened and elevated; and since all the existing high mountain ranges are of a comparatively late age, it is probable that this primeval dry land was low, as well as, in the earlier part of the period at least, of comparatively small extent. It is, however, by no means certain that there may not have been a greater expanse of land toward the close of this period, than that which afterwards existed in those older periods of animal life to which the earliest fossiliferous rocks of the geologist carry us back; since, as already hinted, it seems to be a rule in creation that each new object shall be highly developed of its kind in its first appearance, and since there have been in geological time many great subsidences as well as elevations.

It would be wrong, however, to omit to state, that, though we may know at present no remains of the first dry land, we are not ignorant of its general distribution;

for the present continents show, in the arrangement of their formations and mountain chains, evidence that they are parts of a plan sketched out from the beginning. It has often been remarked by physical geographers that the great lines of coast and mountain ranges are generally in directions approaching to north-east and south-west, or north-west and south-east, and that where they run in other directions, as in the case of the south of Europe and Asia, they are much broken by salient and re-entering angles, formed by lines having these directions. Prof. Pierce, of Harvard College, was, I believe, the first to point out that these lines are in reality parts of great circles tangent to the Polar circles, and to suggest a theory of their origin, based on the action of solar heat and the seasons on a cooling earth. The theory appears inadequate to account for the fact; but this remains, and shows that in the formation of its surface inequalities, the earth has cracked—so to speak—along two series of great circles tangent to the Polar circles; and that these, with certain subordinate though apparently still older lines of fracture running east and west, have determined the forms of the continents from their origin.

M. Elie de Beaumont, and after him many other geologists, attribute the elevation of continents and the upheaval and plication of mountain chains, to the secular refrigeration of the earth, causing its outer shell to become too capacious for its contracting interior mass, and thus to break or bend, and settle towards the centre. This view

would well accord with the terms in which the elevation of the land is mentioned throughout the Bible, and especially with the general progress of the work as we have gleaned it from the Mosaic narrative; since from the period of the desolate void and aeriform deep, to that now before us, secular refrigeration must have been the great leading process.

De Beaumont has extended his general theory into a complex system, connecting the relative ages of mountain systems with their directions. This system is as yet, however, among the uncertain results of the science of the earth, and we cannot look for such details in the scriptures. For this reason, I have been content with the more general statement given above, which enforces the leading truth now before us, that the first dry land was essentially that which, variously modified and extended, and covered by successive formations,* still exists.

* It is also to be noted, that, in so far as aqueous deposits, as well as igneous outbursts, are concerned in the building of continents, these must in all periods have been guided and modified by the original lines of fracture.

CHAPTER X.

THE FIRST VEGETATION.

GENESIS i. 11: "And God said let the earth bring forth the tender herb, the herb bearing seed, and the fruit tree yielding fruit, after its kind, whose seed is in it on the earth; and it was so: and the earth brought forth the tender herb, the herb yielding seed, and the tree bearing fruit whose seed is in it, after its kind: and God saw that it was good."

THE same creative period that witnessed the first appearance of dry land, saw it also clothed with vegetation; and it is quite likely that this is intended to teach that no time was lost in clothing the earth with plants,—that the first emerging portions received their vegetable tenants as they became fitted for them,—and that each additional region, as it rose above the surface of the waters, in like manner received the species of plants for which it was adapted. What was the nature of this earliest vegetation? The sacred writer specifies three descriptions of plants as included in it; and, by considering the terms which he uses, some information on this subject may be gained.

Deshé, translated "grass" in our version, is derived from a verb signifying to spring up or bud forth; the same verb, indeed, used in this verse to denote "bringing forth," literally causing to spring up. Its radical meaning is, therefore, vegetation in the act of sprouting or springing forth; or, as connected with this, young and delicate herb-

age. Thus, in Job 38th, "to satisfy the desolate and waste ground, and to cause the bud of the *young herbage* to spring forth." Here the reference is, no doubt, to the bulbous and tuberous-rooted plants of the desert plains, which, fading away in the summer drought, burst forth with magical rapidity on the setting-in of rain. The following passages are similar:—Psalm 23d, "He maketh me to lie down in green pastures" (literally young or *tender herbage*); Deuteronomy 23d, "Small rain upon the *tender herb*"; Isaiah 37th, "*Grass* on the house-tops." The word is also used for herbage such as can be eaten by cattle or cut down for fodder, though even in these cases the idea of young and tender herbage is evidently included; "Fat as an heifer at *grass*," (Jer. 14),—that is, feeding on young succulent grass, not that which is dry and parched. "Cut down as the grass or wither as the green herb," like the soft tender grass soon cut down and quickly withering. With respect to the use of the word in this place, I may remark—1. It is not here correctly translated by the word "grass"; for grass bears seed, and is, consequently, a member of the second class of plants mentioned. Even if we set aside all idea of inspiration, it is obviously impossible that any one living among a pastoral or agricultural people, could have been ignorant of this fact. 2. It can scarcely be a general term, including all plants when in a young or tender state. The idea of their springing up is included in the verb, and this was but a very temporary condition. Besides, this word does not

appear to be employed for the young state of shrubs or trees. 3. We thus appear to be shut up to the conclusion, that *deshé* here means those plants, mostly small and herbaceous, which bear no proper seeds;* in other words, the Cryptogamia, as fungi, mosses, lichens, ferns, &c. The remaining words are translated with sufficient accuracy in our version. They denote seed-bearing or phœnogamous herbs and trees. The special mention of the fructification of plants is probably intended not only for distinction, but also to indicate the new power of organic reproduction now first introduced on the surface of our planet, and to mark its difference from the creative act itself.

The arrangement of plants in the three great classes of cryptogams, seed-bearing herbs, and fruit-bearing trees, differs in one important point, viz., the separation of herbaceous plants from trees, from modern botanical classifications. It is, however, sufficiently natural for the purposes of a general description like this, and perhaps gives more precise ideas of the meaning intended than any other arrangement equally concise and popular. It is also probable that the object of the writer was not so much a natural history classification, as an account of the *order* of creation, and that he wishes to affirm that the introduction of these three classes of plants on the earth corresponded with the order here stated. This view renders it unneces-

* Tenera herba, sine semine saltem conspicuo."—*Rosenmuller, Scholia.*

sary to vindicate the accuracy of the arrangement on botanical grounds, since the historical order was evidently better suited to the purpose in view.

A very important truth is contained in the expression, "after its kind"; that is, after its *species;* for the Hebrew "*min*", used here, has strictly this sense, and, like the Greek *idea* and the Latin *species*, conveys the notion of form as well as that of kind. It is used to denote species of animals, in Leviticus i. and 14, and in Deuteronomy xiv. and 15. We are taught by this statement that plants were created each kind by itself, and that creation was not a sort of slump-work to be perfected by the operation of a law of development, as fancied by some modern speculators. In this assertion of the distinctness of species, and the production of each by a distinct creative act, revelation tallies perfectly with the conclusions of natural science, which lead us to believe that each species is permanently reproductive, variable within narrow limits, incapable of permanent intermixture with other species, and a direct product of creative power.

Some additional facts contained in the recapitulation of the creative work in chapter ii., may very properly be considered here, as they seem to refer to the climatal conditions of the earth during the growth of this most ancient vegetation, and before the final adjustment of the astronomical relations of the earth on the fourth day. "And every shrub of the land before it was on the earth, and every herb of the land before it sprung up. For the Lord

God had not caused it to rain on the earth, and there was not a man to till the ground; but a mist ascended from the earth and watered the whole surface of the ground." * This has been supposed to be a description of the state of the earth during the whole period anterior to the fall of man. There is, however, no scripture evidence of this; and geology informs us that rain fell as at present, at least as far back as the carboniferous period,† countless ages before the creation of man or the existing animals. Although, however, such a condition of the earth as that stated in these verses, has not been known in any geological period, yet it is not inconceivable, but in reality corresponds with the other conditions of nature likely to have prevailed on the third day, as described in Genesis. The land of this period, we may suppose, was not very extensive, nor very elevated. Hence the temperature would be uniform, and the air moist. The luminous and calorific matter connected with the sun, still occupied a large space, and therefore diffused heat and light more uniformly than at present. The internal heat of the earth, may still have produced an effect in warming the oceanic waters. The combined operation of these causes, of which we, perhaps,

* Bush proposes to read, "nor had a mist ascended," &c. This seems, however, in this place, a forced rendering of the Hebrew.

† Recent observations of the writer appear to carry it back to the Devonian period. See Proc. Geol. Society of London, 1859.

have some traces as late as the carboniferous period, might well produce a state of things in which the earth was watered, not by showers of rain, but by the gentle and continued precipitation of finely divided moisture, in the manner now observed in those climates in which vegetation is nourished for a considerable part of the year by nocturnal mists and copious dews. The atmosphere, in short, as yet partook in some slight degree of the same moist and misty character, which prevailed before the "establishment of the clouds above," the airy firmament of the second day. The introduction of these explanatory particulars by the sacred historian, furnishes an additional argument for the theory of long periods. That vegetation should exist for two or three natural days without rain or the irrigation which is given in culture, was, as already stated, a circumstance altogether unworthy of notice; but the growth during a long period, of a varied and highly organised flora, without this advantage, and by the aid of a special natural provision afterward discontinued, was in all respects so remarkable and so highly illustrative of the expedients of the divine wisdom, that it deserved a prominent place.

It is evident that the words of the inspired writer include plants belonging to all the great sub-divisions of the vegetable kingdom. This earliest vegetation was not rude or incomplete, or restricted to the lower forms of life. It was not even, like that of the coal period, solely or mainly cryptogamous and gymnospermous. It included trees

bearing fruit, as well as lichens and mosses, and it received the same stamp of approbation bestowed on other portions of the work—"it was good." We have a good right to assume that its excellence had reference not only to its own period but to subsequent conditions of the earth. Vegetation is the great assimilating power, the converter of inorganic into organic matter suitable for the sustenance of animals. In like manner the lower tribes of plants prepare the way for the higher. We should therefore have expected *a priori*, that vegetation would have clothed the earth before the creation of animals, and a sufficient time before it to allow soils to be accumulated, and surplus stores of organic matter to be prepared in advance: this consideration alone, would also induce us to assign a considerable duration to the third day. After the elevation of land and the draining off from it of the saline matter with which it would be saturated, a process often very tedious, especially in low tracts of ground, the soil would still only consist of mineral matter, and must have been for a long period occupied by plants suited to this condition of things, in order that sufficient organic matter might be accumulated for the growth of a more varied vegetation; a consideration which perhaps illustrates the order of the plants in the narrative.

It may be objected to the above views that, however accordant with chemical and physiological probabilities, they do not harmonize with the facts of geology; since the earliest fossiliferous formations contain almost exclusively the remains of animals, which must therefore have preceded,

or at least been coeval with the earliest forms of terrestrial vegetation. This objection is founded on well-ascertained facts, but facts which may have no connection with the third day of creation when regarded as a long period. The oldest geological formations are of marine origin, and contain remains of marine animals with those of plants supposed to be allied to the existing algae or sea-weeds. Geology cannot, however, assure us either that no land plants existed contemporaneously with these earliest animals, or that no land flora preceded them. These oldest fossiliferous rocks may mark the commencement of animal life, but they testify nothing as to the existence or non-existence of a previous period of vegetation alone. Farther, the rocks formed prior to these oldest fossiliferous strata, exist as far as yet known in a condition so highly metamorphic as almost to preclude the possibility of their containing any distinguisable fossils. It is possible therefore, that in these Azoic rocks we may have remnants of the formations of the third Mosaic day; and if we should ever be so fortunate as to find any portion of them containing fossils, and these the remains of plants differing from any hitherto known, either in a fossil state or recent; and rising higher, in elevation and complexity of type, than the flora of the succeeding silurian and carboniferous eras, we may then suppose that we have penetrated to the monuments of this third creative Aeon. The only other alternative by which these verses can be reconciled with geology is that adopted by the late Hugh Miller, who supposes that

the plants of the third day are those of the carboniferous period; but beside the apparent anachronism involved in this, we now know that the coal flora consisted mainly of cryptogams allied to ferns and club mosses, and of gymnosperms allied to the pines and cycads; the higher orders of plants being almost entirely wanting. For these reasons we are shut up to the conclusion that this flora of the third day must have its place before the Palæozoic period of Geology. That there were plants before this period, we may infer almost with certainty from the abundance and distribution of carbonaceous matter in the form of graphite, in the Azoic or Laurentian rocks of Canada; but of the form or structure of these plants we know nothing.*

To those who are familiar with the vast lapse of time required by the geological history of the earth, it may be startling to ascribe the whole of it to two or three of the creative days. If, however, it be admitted that these days were periods of unknown duration, no reason remains for limiting their length any farther than the facts of the case require. If in the strata of the earth which are accessible to us, we can detect the evidence of its existence for myriads of years, why may not its Creator be able to carry our view back for myriads more. It may be humbling to our pride of knowledge, but it is not on any scientific ground improbable, that the oldest animal remains known to geology belong to the middle period of the earth's history, and were preceded by an enormous lapse of ages in which

* See Appendix D.

the earth was being prepared for animal existence, but of which no records remain, except those contained in the inspired history.

It would be quite unphilosophical for geology to affirm either that animal life must always have existed, or that its earliest animals are necessarily the earliest organic beings. To use, with a slight modification, the words of one of the ablest of our younger geologists,* "For ages the prejudice prevailed that the historical period, or that which is coeval with the life of man, exhausted the whole history of the globe. Geologists removed that prejudice," but must not substitute "another in its place, viz: that geological time is coeval with the globe itself, or that organic life always existed on its surface."

A farther objection to the existence of this primitive flora, may be based on the statement that it included the highest forms of plants. Had it consisted only of low and imperfect vegetables, there might have been much less difficulty in admitting its probability. Farther, we find that even in the carboniferous period, scarcely any plants of the higher orders flourished, and there was a preponderance of the lower forms of the vegetable kingdom. We have, however, in geological chronology, many illustrations of the fact that the progress of improvement has not been continuous or uninterrupted, and that the preservation of the flora and fauna of many geological periods has been very im

* Haughton, Address to Geological Society, Dublin.

perfect. Hence the occurrence in one particular stratum or group of strata, of few or low representatives of animal and vegetable life, affords no proof that a better state of things may not have existed previously. We also find, in the case of animals, that each tribe attained to its highest development at the time when, in the progress of creation, it occupied the summit of the scale of life. Analogy would thus lead us to believe that when plants alone existed, they may have assumed nobler forms than any now existing, or that tribes now represented by few and humble species, may at that time have been so great in numbers and development as to fill all the offices of our present complicated flora, as well as, perhaps, some of those now occupied by animals. We have this principle exemplified in the carboniferous flora, by the magnitude of its arborescent club-mosses, and the vast variety of its gymnosperms.* For this reason we may anticipate that if any remains of this early plant-creation should ever be disinterred, they will prove to be among the most wonderful and interesting geological relics ever discovered, and will enlarge our views of the compass and capabilities of the vegetable kingdom, and especially of its lower forms.

A farther objection is the uselessness of the existence of plants for a long period, without any animals to subsist on or enjoy them, and even without forming any accumulation of fossil fuel or other products useful to man. The only

* Appendix E.

direct answer to this has been already given. The previous existence of plants may have been, and probably was, essential to the comfort and subsistence of the animals afterwards introduced. Independently of this, however, we have an analogous case in the geological history of animals, which prevents this fact from standing alone. Why was the earth tenanted so long by the inferior races of animals, and why were so much skill and contrivance expended on their structures and even on their external ornament, when there was no intelligent mind on earth to appreciate their beauties. Even in the present world we may as well ask why the uninhabited islands of the ocean are found to be replete with luxuriant vegetable life, why God causes it to rain in the desert where human foot never treads, or why he clothes with a marvellous exuberance of beautiful animal and plant forms the depths of the sea. We can but say that these things seemed and seem good to the Creator, and may serve uses unknown to us; and this is precisely what we must be content to say respecting the plant-creation of the Azoic period.

Some writers* on this subject have suggested that the cosmical use of this plant-creation was the abstraction from the atmosphere of an excess of carbonic acid unfavourable

* See McDonald, "Creation and Fall." Prof. Guyot, I believe, deserves the credit of having first mentioned, on the American side of the Atlantic, the doctrine respecting the introduction of plants advocated in this chapter.

to the animal life subsequently to be introduced. This use it may have served, and when its effects had been gradually lost through metamorphism and decay, that second great withdrawal of carbon which took place in the carboniferous period may have been rendered necessary. The reasons afforded by natural history for supposing that plants preceded animals, are thus stated by Prof. Dana:—

"The proof from science of the existence of plants before animals is inferential, and still may be deemed satisfactory. Distinct fossils have not been found: all that ever existed in the azoic rocks having been obliterated. The arguments in the affirmative are as follows:

1. The existence of limestone rocks among the other beds, similar limestones in later ages having been of organic origin; also the occurrence of carbon in the shape of graphite, graphite being, in known cases in rocks, a result of the alteration of the carbon of plants.

2. The fact that the cooling earth would have been fitted for vegetable life for a long age before animals could have existed; the principle being exemplified everywhere, that the earth was occupied at each period with the highest kinds of life the conditions allowed.

3. The fact that vegetation subserved an important purpose in the coal-period, in ridding the atmosphere of carbonic acid for the subsequent introduction of land animals, suggests a valid reason for believing that the same great purpose, the true purpose of vegetation, was effected through the ocean before the *waters* were fitted for animal life.

4. Vegetation being directly or mediately the food of animals, it must have had a previous existence. The latter part of the azoic age in geology, we therefore regard as the age when the plant-kingdom was instituted, the latter half of the third day in Genesis. However short or long the epoch, it was one of the great steps of progress."

In concluding the examination of the work of the third day, I must again remind the reader that on the theory of long creative periods, the words under consideration must refer to the first introduction of vegetation, in forms that have long since ceased to exist. Geology informs us that in the period of which it is cognisant, the vegetation of the earth has been several times renewed, and that no plants of the older and middle geological periods now exist. We may therefore rest assured that the vegetable species, and probably also many of the generic and family forms of the vegetation of the third day, have long since perished and been replaced by others, suited to the changed condition of the earth. It is indeed probable that, during the third and fourth days themselves, there might be many removals and renewals of the terrestrial flora, so that perhaps every species created at the commencement of the introduction of plants, may have been extinct before the close of the period. Nevertheless it was marked by the introduction of vegetation, which in one or another set of forms has ever since clothed the earth.

At the commencement of the third day the earth was still covered by the waters. As time advanced, islands and

mountain peaks arose from the ocean, vomiting forth the molten and igneous materials of the interior of the earth's crust. Plains and vallies were then spread around, rivers traced out their beds, and the ocean was limited by coasts and divided by far-stretching continents. At the command of the Creator, plants sprung from the soil—the earliest of organized structures—at first probably few and small, and fitted to contend against the disadvantages of soils impregnated with saline particles and destitute of organic matter; but as the day advanced, increasing in number, magnitude and elevation, until at length the earth was clothed with a luxuriant and varied vegetation, worthy the approval of the Creator, and the admiring song of the angelic "Sons of God."

CHAPTER XI.

LUMINARIES.

Genesis i. 15 to 19: "And God said, let there be luminaries in the expanse of heaven, to divide the day from the night; and let them be for signs and for seasons and for days and for years. And let them be for luminaries in the expanse of heaven to give light on the earth; and it was so.

And God made two great luminaries, the greater luminary to preside over the day, the lesser luminnary to preside over the night. He made the stars also. And God placed them in the expanse of heaven to give light on the earth, and to preside over the day and over the night, and to separate the light from the darkness; and God saw that it was good; and the evening and the morning were the fourth day."

After so long a sojourn on the earth, we are in these verses again carried to the heavens. Every scientific reader is struck with the position of these verses, interrupting as they do the progress of the organic creation, and constituting a break in the midst of the terrestrial history which is the immediate subject of the narrative; thus in effect, as has often been remarked, dividing the creative week into two portions. Why was the completion of the heavenly bodies so long delayed. Why were light and vegetation introduced previously. If we cannot fully answer these questions, we at least feel convinced that the position of these verses is not accidental, and not that which would

have been chosen by any fabricator of systems ancient or modern. Let us inquire, however, what are the precise terms of the record.

1. The word here used to denote the objects produced, clearly distinguishes them from the product of the first day's creation. Then God said "let *light* be:" he now says "let *luminaries* be." We have already seen that the light of the first day may have emanated from an extended luminous mass, at first occupying the whole extent of the solar system, and more or less attached to the several planetary bodies, and afterwards concentrated within the earth's orbit. The verses now under consideration inform us that the process of concentration was now complete, that our great central luminary had attained to its perfect state. This process of concentration may have been proceeding during the whole of the intervening time, or it may have been completed at once by a direct interposition of creative power. The latter is the more probable view.

2. The division of light from darkness is expressed by the same terms, and is of the same nature with that on the first day. This separation was now produced in its full extent, by the perfect condensation of the luminous ether around the sun.

3. The heavenly bodies are said to be for *signs*—that is, for marks or indications—either of the seasons, days and years afterwards mentioned; or of the majesty and power of the true God, as the Creator of objects so grand and elevated as to become to the ignorant heathen objects of

idolatrous worship; or perhaps of the earthly events they are supposed to influence. The arrangements now perfected for the first time, enabled natural days, seasons and years to have their limits accurately marked. Previously to this period, there had been no distinctly marked seasons, and consequently no natural separation of years, nor were the limits of days at all accurately defined.

4. The terms *expanse* and *heaven*, previously applied to the atmosphere, are here combined to denote the more distant starry and planetary heavens. There is no ambiguity involved in this, since the writer must have well known that no one could so far mistake, as to suppose that the heavenly bodies are placed in that atmospheric expanse which supports the clouds.

5. The luminaries were *made* or appointed to their office on the fourth day. They are not said to have been created, being included in the creation of the beginning. They were now completed, and fully fitted for their work. An important part of this fitting seems to have been the setting or placing them in the heavens, conveying to us the impression that the mutual relations and regular motions of the heavenly bodies were now for the first time perfected.

6. The stars are introduced, in a parenthetical manner, which leaves it doubtful whether we are merely informed in general terms that they are works of God, as well as those heavenly bodies which are of more importance to us, or that they were arranged as heavenly luminaries useful to our earth on the fourth day. The term includes the

fixed stars, and it is by no means probable that these were in any way affected by the work of the fourth day, any farther than their appearance from our earth is concerned. This view is confirmed by the language of the 104th Psalm, which, in this part of the work, mentions the sun and moon alone, without the fixed stars or planets.

It is evident that the changes of this period related to the whole solar system, and resulted in the completion of that system in the form which it now bears, or at least in the final adjustment of the motions and relations of the earth; and we have reason to believe that the condensation of the luminous ether around the sun, was one of the most important of these changes. On the hypothesis of La Place, formerly adopted by us, as most in accordance with the earlier stages of the work, there seems to be no especial reason why the completion of the process of elaboration of the sun and planets should be accelerated at this particular stage. We can easily understand, however, that those closing steps which brought the solar system into a state of permanent and final equilibrium, would form a marked epoch in the work; and we can also understand that now, when on the eve of introducing animal life, it might be proper for the Creator to interfere to close up the merely inorganic part of his great work, and bring this department at least to its final perfection. The fourth day, then, in geological language, marks *the complete introduction of "existing causes" in inorganic nature*, and we henceforth find no more creative interference, except in the

domain of organization. This accords admirably with the deductions of modern geology, and especially with that great principle so well expounded by Sir Charles Lyell, and which forms the true basis of modern geological reasonings; that we should seek in existing causes of change for the explanation of the appearances of the rocks of the earth's crust. Geology probably carries us back to the introduction of animal life; and shows us that, since that time, land, sea and atmosphere, summer and winter, day and night,—all the great inorganic conditions affecting animal life, have existed as at present, and have been subject to modifications the same in kind with those which they now experience, though perhaps different in degree. In these verses we find in like manner, that the period immediately preceding the creation of animals witnessed the completion of all the great general arrangements on which these phenomena depend. Scripture, therefore, and science agree in the truth that existing causes have been in full force since the creation of animals; and that since that period, the exercise of creative power has been limited to the organic world. There are modern physicists and philosophers who stumble at the doctrine that the introduction of species of animals and plants implies direct creative power, and who desire to have the geologist refer this as well as merely physical changes to laws still in operation. Naturalists oppose to such views all experience, the wonderful structures and forms of animals, and the manner in which species appear in geological time. One of the most eminent

of living naturalists* well remarks that if we take as the simplest form of the animal its egg, and examine the wondrous structures and powers apparent there, we cannot after such study suppose the origin of a species from any mere physical cause. Moses sides on this point with the geologists and naturalists, by affirming that the creative arrangements relating to mere matter ceased on the fourth day, after which all in this department proceeds on unchanging law, creation continuing only with reference to animate existence.†

The verses relating to the fourth day are silent respecting the mundane history of the period; and geology gives no very certain information concerning it. If, however, we assume that the Azoic rocks are deposits of this or the preceding period, we may infer from the disturbances and alteration which these have suffered, prior to the deposition of the silurian series, that during or toward the close of this day, the crust of the earth was affected by great movements. There is another consideration also leading to important conclusions in relation to this period. In the earliest fossiliferous rocks, there seems to be good evidence, that the dry land contemporary with the seas in which they were formed, was of very small extent. Now, since on the third day a very plentiful and highly developed vegetation was produced, we may infer that during that

* Agassiz, "Contributions to the Natural History of America."

† Appendix F.

day the extent of dry land was considerable, and was probably gradually increasing. If then the Cambrian and Silurian systems, the oldest fossiliferous rocks known, belong to the commencement of the fifth day, we must conclude that, during the fourth, much of the land previously existing had been again submerged. In other words, during the third day the extent of terrestrial surface was increasing, on the fourth day it diminished, and on the fifth it again increased, and probably has on the whole continued to increase up to the present time. One most important geological consequence of this is, that the marine animals of the fifth day probably commenced their existence on sea bottoms, which were the old soil surfaces of submerged continents previously clothed with vegetation, and which consequently contained much organic matter, fitted to form a basis of support for the newly created animals.

I shall close my remarks on the fourth day by a few quotations from those passages of scripture which refer to the objects of this day's work. I have already referred to that beautiful passage in Deuteronomy, where the Israelites are warned against the crime of worshipping those heavenly bodies, which the Lord God hath "divided to every nation under the whole heaven." In the book of Job also, we find that the heavenly bodies were in his day regarded as signal manifestations of the power of God, and that several of the principal constellations had received names.

"He commandeth the sun and it shineth not,
He sealeth up the stars,†
He alone spreadeth out the heavens,
And walketh on the high waves of the sea,
He maketh Arcturus, Orion,
The Pleiades and the secret chambers of the south,
Who doeth great things past finding out,
Yea, marvellous things beyond number.."—*Job* 9, 9.

"Canst thou tighten the bonds of the Pleiades*
Or loose the bands of Orion.
Canst thou bring forth the Mazzaroth in their season,
Or lead forth Arcturus and its sons,
Knowest thou the laws of the heavens,
Or hast thou appointed their dominion over the earth."—*Job* 38, 31.

† This may refer to an eclipse, but from the character of the preceding verses more probably to the obscurity of a tempest. It is remarkable that eclipses, which so much strike the minds of men and affect them with superstitious awe, are not distinctly mentioned in the Old Testament, though referred to in the prophetical parts of the New Testament.

* The rendering "sweet influences" in our version may be correct, but the weight of argument appears to favour the view of Gesenius that the close bond of union between the stars of this group is referred to. I think it is Herder who well unites both views, the Pleiades being bound together in a sisterly union, and also ushering in the spring by their appearance above the horizon. Conant applies the whole to the seasons, the bands of Orion being those of winter.

I may merely remark on these passages, that the chambers of the south are supposed to be those parts of the southern heavens invisible in the latitude in which Job resided. The bonds of Pleiades and of Orion, probably refer to the apparently close union of the stars of the former group, and the wide separation of those of the latter; a difference which, to the thoughtful observer of the heavens, is more striking than most instances of that irregular grouping of the stars which still forms a question in astronomy, from the uncertainty whether it is real, or only an optical deception arising from stars at different distances coming nearly into a line with each other. I have seen in some recent astronomical work, this very instance of the Pleiades and Orion taken as a marked illustration of this problematical fact in astronomy. *Mazzaroth* are supposed by modern expositors to be the signs of the Zodiac. On the whole, the Hebrew books give us little information as to the astronomical theories of the time when they were written. They are entirely non-committal as to the nature of the connections and revolutions of the heavenly bodies; and indeed regard these as matters in their time beyond the grasp of the human mind, though well known to the Creator and regulated by his laws. From other sources we have facts leading to the belief that even in the time of Moses, and certainly in that of the later biblical writers, there was not a little practical astronomy in the east, and some good theory. The Hindoo astronomy professes to have observations from 3000 B.C., and the arguments of Baily and others,

founded on internal evidence, give some colour of truth to the claim. The Chaldeans at a very early period had ascertained the principal circles of the sphere, the position of the poles, and the nature of the apparent motions of the heavens as the results of revolution on an inclined axis. The Egyptian astronomy we know mainly from what the Greeks borrowed from it. Thales 640 B. C., taught that the moon is lighted by the sun, and that the earth is spherical, and the position of its five zones. Pythagoras 580 B. C., knew, in addition to the sphericity of the earth, the obliquity of the ecliptic, the identity of the evening and morning star, and that the earth revolves round the sun. This Greek astronomy appears immediately after the opening of Egypt to the Greeks; and both these philosophers studied in that country. Such knowledge, and more of the same character, may therefore have existed in Egypt at a much earlier period.

The psalms abound in fine references to the creation of the fourth day.

"When I consider the heavens the work of thy fingers,
The moon and the stars which thou hast ordained,
What is man that thou art mindful of him,
Or the son of man that thou visitest him."—*Psalm* 8.

"Who telleth the number of the stars,
Who calleth them all by their names,
Great is our Lord, and of great praise,
His understanding is infinite.
The Lord lifteth up the meek,
He casteth the wicked to the ground."—*Psalm* 147.

"The heavens declare the glory of God,
The firmament showeth his handywork;
Day unto day uttereth speech,
Night unto night showeth knowledge,
They have no speech nor language,
Their voice is not heard;
Yet their line is gone out to all the earth,
And their words to the end of the world.
In them hath he set a pavilion for the sun,
Which is as a bridegroom coming out of his chamber,
And rejoiceth as a strong man to run a race.
Its going forth is from the end of the heavens
And its circuit unto the end of them."
And there is nothing hid from the heat thereof."—*Psalm* 19.

These are excellent illustrations of the truth of the scripture mode of treating natural objects, in connection with their Maker. It is but a barren and fruitless philosophy which sees the work and not its author—a narrow piety which loves God and despises his works. The Bible holds forth the golden mean between these extremes, in a strain of lofty poetry and acute perception of the great and beautiful, whether seen in the Creator or reflected from his works.

The work of this day opens up a wide field for astronomical illustration, more especially in relation to the wisdom and benevolence of the Creator as displayed in the heavens; but it would be foreign to our present purpose to enter into these. The objects of the writer of Genesis may be summed up in the following general statements:

1. The heavenly hosts and their arrangements are the work of Jehovah, and are regulated wholly by his laws or ordinances; a striking illustration of the recognition by the Hebrew writer both of creative interference, and that stable natural law which too often withdraws the mind of the philosopher from the ideas of creation and of providence.

2. The heavenly bodies have a relation to the earth—are parts of the same plan, and whatever other uses they were made to serve, were made for the benefit of man.

3. The general physical arrangements of the solar system were perfected before the introduction of animals on our planet.

CHAPTER XII.

THE LOWER ANIMALS.

GENESIS i. 20 to 23: "And God said, let the waters swarm with swarming living creatures, and let birds fly on the surface of the expanse of heaven. And God created great reptiles and every living moving thing, which the waters brought forth abundantly, after their kind, and every bird after its kind; and God saw that it was good.

And God blessed them, saying be fruitful and multiply, and fill the waters of the seas, and let the flying creatures multiply in the earth. And the evening and the morning were the fifth day."

In these words, so full of busy, active, thronging life, we now enter on that part of the earth's history which has been most fully elucidated by geology, and we have thus an additional reason for carefully weighing the terms of the narrative, which here, as in other places, contain large and important truths couched in language of the simplest character.

1. In accordance with the views now entertained by the best lexicographers, the word translated in our version "creeping things" has been rendered "prolific or swarming creatures." The Hebrew is *Sheretz*, a noun derived from the verb used in this verse to denote bringing forth abundantly. It is loosely translated in the Septuagint *Erpeta*, reptiles; and this view our English translators appear to have adopted, without, perhaps, any very clear

notions of the creatures intended. The manner in which it is used in other passages, places its true meaning beyond doubt. I select as illustrations of the most apposite character, those verses in Leviticus in which clean and unclean animals are specified, and in which we have a right to expect the most precise zoological nomenclature that the Hebrew can afford. In Leviticus 11th and 20th to 23rd, *Insects* are defined to be *flying sheretzim*, and in verses 29th, &c., under the designation "*Sheretzim of the land*" we have animals named in our version the weasel, mouse, tortoise, ferret, chameleon, lizard, snail and mole. The first of these animals is believed to have been a burrowing creature, perhaps a mole; the second, from the meaning of its name "ravager of fields," is thought to have been a mouse. Some doubt, however, attends both of these identifications, but it appears certain that the remaining six species are small reptiles, principally lizards. We learn, therefore, that the smaller reptiles, and *perhaps* also a few small mammals, are *sheretzim*. In verses 41 and 42 we are introduced to other tribes. "And every *sheretz* that swarmeth on the earth, shall be an abomination unto you, it shall not be eaten; whatsoever goeth upon the belly (serpents, worms, snails, &c.), and whatsoever hath more feet (than four), (insects, arachnidans, myriapods). In verses 9 and 10 of the same chapter, we have an enumeration of the sheretzim of the waters: "Whatsoever hath fins and scales in the waters, in the seas and in the rivers, them shall ye eat. And all that have not fins and scales in the seas and

the rivers, of all that swarm in the waters (all the *sheretzim* of the waters), they shall be an abomination unto you." Here the general term *sheretz* includes all the fishes and the mollusca, radiata and articulata of the waters. From the whole of the above passages, we learn that this is a general term for all the invertebrate animals and the two lower classes of vertebrates, or in other words, for the whole animal kingdom except the mammalia and birds. To all these creatures the name is particularly appropriate, all of them being oviparous or ovo-viviparous, and consequently producing great numbers of young and multiplying very rapidly. The only other creatures which can be included under the term, are the two doubtful species of small mammals already mentioned. Nothing can be more fair and obvious than this explanation of the term, based both on etymology and on the precise nomenclature of the ceremonial law. We conclude, therefore, that the prolific animals of the fifth day's creation belonged to the three sub-kingdoms of the Radiata, Articulata and Mollusca, and to the classes of Fish and Reptiles among the vertebrata.

2. One peculiar group of *sheretzim* is especially distinguished by name—the *tanninim*, or "great whales" of our version. It would be amusing, had we time, to notice the variety of conjectures to which this word has given rise, and the perplexities of commentators in reference to it. In our version and the septuagint, it is usually rendered dragon; but in this place the seventy have thought proper to put *Ketos* (whale), and our translators have followed them.

Subsequent translators and commentators have laid under contribution all sorts of marine monsters, including the sea-serpent, in their endeavours to attach a precise meaning to the word; while others have been content to admit that it may signify any kind or all kinds of large aquatic animals. The greater part of the difficulty has arisen from confounding two distinct words, *tannin* and *tan*, both names of animals; and the confusion has been increased by the circumstance, that in two places the words have been interchanged, probably by errors of transcribers. *Tan* occurs in twelve places, and from these we can gather that it inhabits ruined cities, deserts, and places to which ostriches resort, that it suckles its young, is of predaceous and shy habits, utters a wailing cry, and is not of large size, nor formidable to man. The most probable conjecture as to the animal intended, is that of Gesenius, who supposes it to be the jackall. The other word (*tannin*), which is that used in the text, is applied as an emblem of Egypt and its kings, and also of the conquering kings of Babylon. It is spoken of as furious when enraged, and formidable to man, and is said to be an inhabitant of rivers and of the sea, but more especially of the Nile. In short, it is the crocodile of the Nile. We can easily understand the perplexity of those writers who suppose these two words to be identical, and endeavour to combine all the characters above mentioned in one animal or tribe of animals. As a farther illustration of the marked difference in the meanings of the two words, we may compare the 34th and

37th verses of the fifty-first chapter of Jeremiah. In the first of these verses the King of Babylon is represented as a "dragon" (*tannin*), which had swallowed up Israel. In the second it is predicted that Babylon itself shall become heaps, a dwelling-place for "dragons" (*tanim*). There can be no doubt that the animals intended here are quite different. The devouring *tannin* is a huge predaceous river reptile, a fit emblem of the Babylonian monarch; the *tan* is the jackall that will soon howl in his ruined palaces. It is interesting to know that philologists trace a connection between *tannin* and the Greek *teino*, Latin *tendo*, and similar words signifying to stretch or extend, in the Sanscrit, Gothic and other languages, leading to the inference that the Hebrew word primarily denotes a lengthened or extended creature, which corresponds well with its application to the crocodile. Taking all the above facts in connection, we are quite safe in concluding that the creatures referred to by the word under consideration, are literally large reptilian animals; and, from the special mention made of them, we may infer that, in their day, they were the lords of creation.*

3. In verse 21st, the remainder of the *sheretzim*, beside the larger reptiles, are included in the general terms, "Living creature that moveth." The term "living crea-

* See Appendix G. It would be unfair to suppress the farther probability that the writer intends specially to indicate that the sacred crocodile of the Nile was itself a creature of Jehovah, and among the humbler of those creatures.

ture" is, literally, "creature having the breath of life";—the power of respiration being apparently in Hebrew the distinctive character of the animal. The word moveth (*ramash*), in its more general sense, expresses the power of voluntary motion, as exhibited in animals in general. In a few places, however, it has a more precise meaning, as in 1 Kings iv. 33, where the vertebrated animals are included in the four classes of "beasts, fowl, *creeping things* (or reptiles, *remes*), and fishes." In the present connection, it probably has its most general sense; unless, indeed, the apparent repetition in this verse relates to the amphibious or semi-terrestrial creatures associated with the great reptiles; and, in that case, smaller reptilian animals alone may be meant.

4. We may again note that the introduction of animal life is marked by the use of the word "create," for the first time since the general creation of the heavens and the earth. We may also note that the animal, as well as the plant, was created "after its kind," or "species by species." The animals are grouped under three great classes,—the Remes, the Tanninim, and the Birds; but, lest any misconception should arise as to the relations of species to these groups, we are expressly informed that the species is here the true unit of the creative work. It is worth while, therefore, to note that this most ancient authority on this much controverted topic, connects species on the one hand with the creative fiat, and on the other with the power of continuous reproduction.

5. In addition to the great mass of sheretzim, so accurately characterised by Milton, as

"——— Reptile with spawn abundant,"

the creation of the fifth day included a higher tribe of oviparous animals, the birds, the fowl or winged creature of the text. Birds alone, we think, must be meant here, as we have already seen that insects are included under the general term *sheretzim.*

6. It is farther to be observed that *the waters* give origin to the first animals; an interesting point, when we consider the contrast here with the creation of plants and of the higher animals, both of which proceed from the earth.

7. It cannot fail to be observed that we have in these verses two different arrangements of the animals created, neither corresponding exactly with what modern science teaches us to regard as the true grouping of the animal kingdom, according to its affinities. The order in the first enumeration should, from the analogy of the chapter, indicate that of successive creation. The order of the second list may, perhaps, be that of the relative importance of the animals, as it appeared to the writer. Or there may have been a two-fold division of the period—the earlier commencing with the creation of the humbler invertebrates, the later characterised by the great reptiles—which is the actual state of the case as disclosed by geology.

8. The Creator recognises the introduction of sentient existence and volition, by *blessing* this new work of his

hands, and inviting the swarms of the newly-peopled world, to enjoy that happiness for which they were fitted, and to increase and fill the earth.

When we inquire what information geology affords respecting the period under consideration, the answer may be full and explicit. Geological discovery has carried us back to an epoch corresponding with the beginning of this day, and has disclosed a long and varied series of living beings, extending from this early period up to the introduction of the higher races of animals. To enter on the geological details of these changes, and on descriptions of the creatures which succeeded each other on the earth, would swell this volume into a treatise on palæontology, and would be quite unnecessary, as so many excellent popular works on this subject already exist. I shall, therefore, confine myself to a few general statements, and to marking the points in which scripture and geology coincide in their respective histories of this long period, which appears to include the whole of the Palæozoic and Mesozoic epochs of geology, with their grand and varied succession of rock formations and living beings.

In the oldest fossiliferous rocks, we find the remains crustaceans, mollusks and radiates, such as shrimps, shellfish, and starfishes, which appear to have inhabited the bottom of a shallow ocean. Among these were some genera belonging to the higher forms of the mollusca and radiata, but apparently as yet no vertebrated animals. Fishes were then introduced, and have left their remains in the upper

Silurian rocks, and very abundantly in the Devonian and Carboniferous, in which also the first reptiles occur. The animal kingdom appears to have reached no higher than the reptiles in the Palæozoic or primary period of geology, and its reptiles are comparatively small and few; though fishes had attained to a point of perfection which they have not since exceeded. There was also, especially in the carboniferous period, an abundant and luxuriant vegetation. The Mesozoic period is, however, emphatically the age of reptiles. This class then reached its climax, in the perfection and magnitude of its species, which filled all those stations in the economy of nature now assigned to the mammalia. Birds, also, belong to this era, and were represented by some very gigantic species. Toward the close of the period, several species of small mammals, of the lowest or marsupial type, appear as a presage of the mammalian creation of the succeeding tertiary era. In these two geological periods, then—the Palæozoic and Mesozoic—we find, first, the lower *sheretzim* represented by the invertebrata and the fishes, then the great reptiles and the birds; and it cannot be denied, that, if we admit that the Mosaic day under consideration corresponds with these geological periods, it would be impossible better to characterise their creations in so few words adapted to popular comprehension. I may add that all the species whose remains are found in the Palæozoic and Mesozoic rocks are extinct, and known to us only as fossils; and their connection with the present system of nature consists

only in their forming with it a more perfect series than our present fauna alone could afford. They belong to the same system of types, but are parts of it which have served their purpose and have been laid aside. The coincidences above noted between geology and scripture, may be summed up as follows.

1. According to both records, the causes which at present regulate the distribution of light and heat and moisture, of land and water, were, during the whole of this period, much the same as at present. The eyes of the trilobite of the old Silurian rocks are fitted for the same conditions with respect to light with those of existing animals of the same class. The coniferous trees of the coal measures show annual rings of growth. Impressions of rain-marks have been found in the shales of the coal measures and Devonian system. Hills and valleys, swamps and lagoons, rivers, bays, seas, coral reefs and shell beds, have all left indubitable evidence of their existence, in the geological record. On the other hand, the Bible shows that all the earth's physical features were perfected on the fourth day, and immediately before the creation of animals. The land and the water have undergone, during this long lapse of ages, many minor changes. Whole tribes of animals and plants have been swept away and replaced by others, but the general aspect of inorganic nature has remained the same.

2. Both records show the existence of vegetation during this period; though the geologic record, if taken alone,

would, from its want of information respecting the third day, lead us to infer that plants are no older than animals, while the Bible does not speak of the nature of the vegetation that may have existed on the fifth day.

3. Both records inform us that reptiles and birds were the higher and leading forms of animals, and that all the lower forms of animals co-existed with them. In both we have especial notice of the gigantic Saurian reptiles of the latter part of the period; and, if we have the remains of a few small species of mammals in the Mesozoic rocks, these, like a few similar creatures apparently included under the word *sheretz* in Leviticus, are not sufficiently important to negative the general fact of the reign of reptiles.*

4. It accords with both records that the work of creation in this period was gradually progressive. Species after species was locally introduced, extended itself, and, after having served its purpose, gradually became extinct. And thus each successive rock formation presents new groups of species, each rising in numbers and perfection above the

* The interesting discovery, by Mr. Beale and others, of thirteen species of mammalia in the Purbeck, and that of Professor Emmons of a few species in rocks of similar age in the Southern States of America, do not invalidate this statement; for all these, like the *Microlestes* of the German trias and the *Amphitherium* of the Stonesfeld slate, are small marsupials belonging to the least perfect type of mammals. The discovery of so many species of these humbler creatures, goes far to increase the improbability of the existence of the higher mammals.

last, and marking a gradual assimilation of the general conditions of our planet to their present state, yet without any convulsions or general catastrophes affecting the whole earth at once.

5. In both records the time between the creation of the first animals and the introduction of the mammalia as a dominant class, forms a well marked period. I would not too positively assert that the close of the fifth day accords precisely with that of the Mesozoic or secondary period. The well marked line of separation, however, between this and the earlier tertiary rocks, points to this as extremely probable. I shall close these remarks by a quotation on this subject from Ansted's "Ancient world:"—"The close of the Secondary (Mesozoic) period was succeeded by a general disruption of the various beds that had been deposited in those parts of the world to which we have access, and by changes and modifications so considerable as to alter the whole face of nature. It would appear, also, that a long period of time elapsed before newer beds were thrown down; since the chalky mud (of the newest Mesozoic rocks) not only had time to harden into chalk, but the surface of the chalk itself was much rubbed and worn. So completely and absolutely is the line of demarcation drawn between the secondary and newer deposits, in parts of the world where these beds have been recognised in actual contact, that it had become a common notion among geologists to assume the destruction of all natural relations between them; concluding that not one single species of

animal or vegetable connected the two periods, and lived through the intervening disturbances. Although this view certainly requires modifications in points of detail, it is still correct in a general sense, and expresses without much exaggeration the real difference in condition, the result perhaps of greater time than is elsewhere indicated. In this way, the secondary period is distinctly cut off from the tertiary." In the same work, chaps. 6th and 11th, will be found vivid sketches of the general features of the inorganic world in the Palæozoic and Mesozoic periods, highly illustrative of the parallelism between these animal remains and the creatures produced on the fifth day.*

It thus appears that scripture and geology so far concur respecting the events of this period, as to establish-even without any other evidence, a probability that the fifth day corresponds with the geological periods with which I have endeavoured to identify it. Geology, however, gives us no means of measuring precisely the length of this day; but it gives us the impression that it occupied an

* No break of continuity in the succession of life revealed by geology can be regarded as established by positive evidence; and most of the breaks of this kind ascertained by the earlier geologists have proved to be merely local. But the one which has maintained itself most constantly in all portions of the earth is certainly that between the Mesozoic and Tertiary. Even in cases where, as in some parts of the tertiary districts of the United States, there seemed to be a gradation of fossils, later observations tend to show a real distinctness.

enormous length of time, compared with which the whole human period is quite insignificant; and rivalling those mythical "days of the Creator" which we have noticed as forming a part of the Hindoo mythology.

Why was the earth thus occupied for countless ages by an animal population whose highest members were reptiles and birds? The fact cannot be doubted, since geology and scripture, the research of man and the word of God, concur in affirming it. We know that the lowest of these creatures was, in its own place, no less worthy of the Creator than those which we regard as the highest in the scale of organization, and that the animals of the ancient, equally with those of the modern world, abounded in proofs of the wisdom, power and goodness of their Maker. Comparative anatomy has shown that these extinct animals, though often varying much from their modern representatives, are in no respect rude or imperfect; that they have the same appearance of careful planning and elaborate execution, the same combination of ornament and utility, the same nice adaptation to the conditions of their existence, which we observe in modern creatures. In addition to this, the many new and wonderful contrivances and combinations which they present, and their relations to existing objects, have greatly enlarged our views of the variety and harmony of the whole system of nature. They are, therefore, in these respects, not without their use as manifestations of the Creator, in this our later age.

There is another reason, hinted at by Buckland, Miller, and other writers on this subject, which weighs much with my mind. All animals and plants are constructed on a few leading types or patterns, which are again divided into subordinate types, just as in architecture we have certain leading styles, and these again may admit of several orders, and these of farther modifications. Types are further modified to suit a great variety of minor adaptations. Now we know that the earth is, at any one time, inadequate to display all the modifications of all the types. Hence our existing system of organic nature, though probably more complete than any that preceded it, is still only fragmentary. It is like what architecture would be, if all memorials of all buildings more than a century old were swept away. But, from the beginning to the end of the creative work, there has been, or will be, room for the whole plan. Hence fossils are little by little completing our system of nature; and, if all were known, would perhaps wholly do so. The great plan must be progressive, and all its parts must be perishable, except its last culminating point and archetype, man. Tennyson gropes after this truth in the following lines:—

"The wish, that of the living whole
No life may fail beyond the grave;
Derives it not from what we have
The likest God within the soul?

Are God and Nature then at strife,
That Nature lends such evil dreams?
So careful of the type she seems,
So careless of the single life.

'So careful of the type?' but no.
From scarped cliff and quarried stone
She cries, 'a thousand types are gone;
I care for nothing, all shall go.

'Thou makest thine appeal to me:
I bring to life, I bring to death:
The spirit does but mean the breath:
I know no more.' And he, shall he,

Man, her last work, who seem'd so fair,
Such splendid purpose in his eyes,
Who roll'd the psalm to wintry skies,
Who built him fanes of fruitless prayer,

Who trusted God was love indeed
And love Creation's final law—
Tho' Nature, red in tooth and claw,
With ravine, shriek'd against his creed—

Who loved, who suffer'd countless ills,
Who battled for the True, the Just,
Be blown about the desert dust,
Or seal'd within the iron hills?

No more? A monster, then, a dream,
A discord. Dragons of the prime,
That tare each other in their slime,
Were mellow music match'd with him.

O life as futile, then, as frail!
O for thy voice to soothe and bless!
What hope of answer, or redress?
Behind the veil, behind the veil."

The Creator himself, however, is not indifferent to the marvellous structures, instincts and powers which he has bestowed upon the lower races of animals. Witness the answer of the Almighty to Job, when he spake out of the whirlwind to vindicate his own plans in creation and pro vidence; and brought before the patriarch a long train of animals, explaining and dwelling on the structure and powers of each, in contrast with the puny efforts and rude artificial contrivances of man. Witness also the preservation, in the rocks, of the fossil remains of extinct creatures, as if he who made them was unwilling that the evidence of their existence should perish, and purposely treasured them through all the revolutions of the earth, that through them men might magnify his great name.* The psalmist

* I do not consider it necessary to notice the singular doctrine of "prochronism," developed in Mr. Gosse's "Omphalos"; since, however ingenious as a specimen of logical skepticism, it cannot be regarded by any one acquainted with geological facts as affording a satisfactory explanation of them. It is interesting chiefly as a modern instance of that barren, metaphysical speculation, which, in a by-gone time, was applied to nature, instead of patient, inductive inquiry. I have no doubt that its excellent author will himself be brought to regard it from this point of view.

would almost appear to have had all these thoughts before his mind, when he poured out his wonder in the 104th Psalm:—

"O Lord, how manifold are thy works!
In wisdom hast thou made them all.
The earth is full of thy riches;
So is this wide and great sea,
Wherein are moving things innumerable,
Creatures both small and great.
There go the ships;
There is leviathan, which thou hast formed to sport therein:
That thou givest them they gather.
Thou openest thy hand, they are filled with good;
Thou hidest thy face, they are troubled;
Thou takest away their breath, they return to their dust.
Thou sendest forth thy spirit, they are created,
And thou renewest the face of the earth."

There are, however, good reasons to believe, that, in the plans of Divine wisdom, the long periods in which the earth was occupied by the inferior races, were necessary to its subsequent adaptation to the residence of man. In these periods our present continents gradually grew up in all their variety and beauty. The materials of old rocks were comminuted and mixed to form fertile soils,* and stores of

* It is very interesting, in connection with this, to note that nearly all the earliest and greatest seats of population and civilisation have been placed on the more modern geological deposits, or on those in which stores of fuel have been accumulated by the growth of extinct plants.

mineral products were accumulated, to enable man in his fallen state to earn subsistence and the blessings of civilisation by the sweat of his brow. And if it pleased the Almighty, during these preparatory processes, to replenish the land and sea with herbs, and trees, and creeping things, and great reptilian monsters,—to fill it with such forms of life as in its imperfect state it was capable of sustaining, who shall venture to criticise his procedure, or say to him, "What doest thou?"

CHAPTER XIII.

THE HIGHER ANIMALS.

GENESIS i. 24 and 25: "And God said, let the land bring forth animals after their kinds; the herbivora, the reptiles, and the carnivora, after their kinds; and it was so. And God made carnivorous mammals after their kinds, and herbivorous mammals after their kinds, and every reptile of the land after its kind; and God saw that it was good."

THE creation of animals, unlike that of plants, occupies two days. Here our attention is restricted to the inhabitants of the *land*, and chiefly to their higher forms. Several new terms are introduced to our notice, which I have endeavoured to translate as literally as possible, by introducing zoological terms, where those in common use were deficient.

1. The first tribe of animals noticed here is named "*Bhemah*"; cattle in our version; and in the septuagint, quadrupeds in one of the verses, and cattle in the other. Both of these senses are of common occurrence in the scriptures, cattle or domesticated animals being usually designated by this word; while in other passages, as in 1 Kings iv. 33, where Solomon is said to have written a treatise on "*beasts*, fowls, creeping things and fishes," it appears to include all the mammalia. Notwithstanding this wide range of meaning, however, there are passages, and these of the greatest authority in reference

to our present subject, in which it strictly means the herbivorous mammals, and which show that when it was necessary to distinguish these from the predaceous or carnivorous tribes, this term was specially employed. In Leviticus xi., verses 22 to 27, we have a specification of all the Bhemoth that might and might not be used for food. It includes all the true ruminants, with the coney, the hare and the hog, animals of the rodent and pachydermatous orders. The carnivorous quadrupeds are designated by a different generic term. In this chapter of Leviticus, therefore, which contains the only approach to a system in natural history to be found in the Bible, *bhemah* is strictly a synonym of *herbivora*, including ruminants, rodents and pachyderms. That this is its proper meaning here, is confirmed by the considerations, that in this place it can denote but a part of the land quadrupeds, and that the idea of cattle or domesticated animals would be an anachronism. At the same time, I have no objection to the view that the especial capacity of ruminants and other herbivora for domestication, is connected with the use of the word in this place.

2. The word "*remes*," creeping things in our version, as we have already shown, is a very general term, referring to the power of motion possessed by animals, especially on the surface of the ground. It here in all probability refers to the additional types of terrestrial reptiles and other creatures lower than the mammals, introduced in this period.

3. The compound term ("*hay'th-eretz*), which I have

ventured to render carnivora, is literally animal of the land; but though thus general in its meaning, it is here evidently intended to denote a particular tribe of animals inhabiting the land, and not included in the scope of the two words already noticed. In other parts of scripture, this term is used in the sense of a "wild beast." In a few places, like the other terms already noticed, it is used for all kinds of animals, but that above stated is its general meaning, and perfectly accords with the requirements of the passage.

The creation of the sixth day therefore includes—1st the herbivorous mammalia, 2nd a variety of terrestrial reptilia and other lower forms not included in the work of the previous day; 3rd, the carnivorous mammalia. It will be observed that the order in the two verses is different. In verse 24th it is, herbivora, "creeping things," and carnivora. In verse 25th it is carnivora, herbivora, and "creeping things." One of them may, as in the account of the fifth day, indicate the order of *time* in the creation, and the other the order of *rank* in the animals made, or there may have been two divisions of the work, in the earlier of which herbivorous animals took the lead, and in the later those that are carnivorous. In either case, we may infer that herbivora predominated in the earlier creations of the period.

It is almost unnecessary to say that this period corresponds with the Tertiary era of geologists. The coincidences are very marked and striking. As already stated, though in

the later secondary period there were great facilities for the preservation of mammals, in the strata then being deposited, only a few small species of the humblest order have been found; and the occurrence of the higher orders of this class, is to some extent precluded by the fact that the place in nature now occupied by the mammals, was then provided for by the vast development of the reptile tribes. At the very beginning of the tertiary period, all this was changed; most of the gigantic reptiles had disappeared, and terrestrial mammals of large size and high organization, had taken their place. During the whole tertiary period, this predominance of the mammalia continued; and as the mesozoic was the period of giant reptiles, so the tertiary was that of great mammals. It is a singular and perhaps not accidental coincidence that so many of the early tertiary mammals known to us are large herbivora, such as would be included in the Hebrew word *Bhemah;* and that in the book of Job the hippopotamus is called *Behemoth,* the plural form being apparently used to denote that this animal is the chief of the creatures known under the general term *bhemah,* while geology informs us that the prevailing order of mammals in the older tertiary period was that of the pachydermata, and that many of these extinct pachyderms are very closely allied to the hippopotamus. Behemoth thus figures in the book of Job, not only as at the time a marked illustration of creative power, but to our further knowledge also as a singular remnant of an extinct gigantic race. It is at least curious that while in the

fifth day great reptiles like those of the secondary rocks form the burden of the work, in the sixth we have a term which so directly reminds us of those gigantic pachyderms which figure so largely in the tertiary period. Large carnivora also occur in the tertiary formations, and there are some forms of reptile life, as for example, the serpents, which first appear in the tertiary.

The following extract from Ansted, in which he sums up the mammalian tribes of the older and middle tertiary periods, forms an apt illustration of the statements of scripture which we have just been considering. I quote this work because its pictures are very vivid, and bring out this correspondence very distinctly. The same facts appear in every popular book on geology, but not in the scenic form which corresponds best with the Mosaic delineation. Hugh Miller has sketched these correspondences in the Testimony of the Rocks; but he writes with the scripture narrative directly in view, which was not the case with Ansted.

"The interior of the land of which the surrounding waters were thus peopled, was no less remarkable, and exhibited appearances equally instructive. Troops of monkeys might be seen skipping lightly from branch to branch in the various trees, or heard mowing and chattering and howling in the deep recesses of the forest. Of the birds, some clothed in plumage of almost tropical brilliancy were busy in the forests, while others, such as the vulture, hovered over the spots where death had been busy; gigantic serpents might be seen invidiously watching their prey.

Other serpents in gaudy dress, were darting upon the smaller quadrupeds and birds, and insects glittered brightly in the sun * * * . With the monkeys were associated small opossums, squirrels, a racoon, and other animals at that time the tenants of the forests. Several of the smaller carnivora prowled about preying on these, and among them a species of fox and wolf, show that as there was a large supply of animal food so there were other animals to avail themselves of the supply. But in all this one thing is remarkable, it is the almost total absence of the tribe of ruminants. None of those which are so useful and necessary to man were then to be seen. The deer tribe and the goat, the sheep, the ox, the camel, all are wanting; and their place was filled by various representatives belonging to the tribe of which the hog, the horse, the rhinoceros and the elephant are the present types. These indeed were abundant and varied enough both in their dimensions, their appearance, and their habits. Some swam in the water; some tripped lightly and elegantly on the borders of the marshes, others constantly on the alert, ran like the wind on the slightest approach of danger. Everything was thus perfectly adapted to animal wants and necessities, but no preparation was yet made for man."

"During this time (the middle tertiary period) the land was becoming peopled with all that rich variety of mammalian life, which characterised the later tertiary periods in the northern hemisphere. In addition to the elephant and the Mastodon, the latter of which soon died out, we

have two distinct and well-marked species of rhinoceros, a hippopotamus, several kinds of horses, large insectivorous animals, and a considerhble number of Carnivora, some of large size, and differing considerably from the groups now inhabiting these parts of the world. We also find an important and very interesting group of true ruminants, including a gigantic deer, and the aurochs. With these are associated marine Mammalia in great variety, forming, on the whole, a singular and well-marked group, interesting in the highest degree for the analogies it exhibits with widely-spread existing species, as well as for the differences presented between it and any neighbouring fauna."

This was the European fauna of the earlier and middle Tertiary. That of the later tertiaries is still rich in pachyderms, represented by the gigantic fossil elephants and mastodons, of which different species appear to have replaced each other in successive sub-divisions of the period. In America we have at the same time a remarkable group of large quadrupeds allied to the modern sloths; and in Europe, America and Asia many true ruminants, as well as formidable carnivora. Yet all or nearly all of these later tertiary animals had disappeared before the advent of man.

Dana well sums up the grand march of mammalian life as follows:—

"The quadrupeds did not all come forth together. Large and powerful herbivorous species first take possession of the earth, with only a few small carnivora. These pass away. Other herbivora with a larger proportion of carnivora

next appear. These also are exterminated; and so with others. Then the carnivora appear in vast numbers and power, and the herbivora also abound. Moreover these races attain a magnitude and number far surpassing all that now exist, as much so indeed, on all the continents, North and South America, Europe, Asia, Africa, and Australia, as the old mastodon, twenty feet long and nine feet high, exceeds the modern buffalo. Such, according to geology, was the age of mammals, when the brute species existed in their greatest magnificence, and brutal ferocity had free play; when the dens of bears and hyenas, prowling tigers and lions far larger than any now existing, covered Britain and Europe. Mammoths and mastodons wandered over the plains of North America, huge sloth-like Megatheria passed their sluggish lives on the pampas of South America, and elephantine marsupials strolled about Australia.

"As the mammalian age draws to a close, the ancient carnivora and herbivora of that era all pass away, excepting, it is believed, a few that are useful to man. New creations of smaller size peopled the groves; the vegetation received accessions to its foliage, fruit-trees and flowers, and the seas brighter forms of water life. This we know from comparisons with the fossils of the preceding mammalian age. There was, at this time, no chaotic upturning, but only the opening of creation to its fullest expansion: and so in Genesis, no new day is begun, it is still the *sixth day*."

CHAPTER XIV.

MAN.

Genesis i. 26 to 31: "And God said, let us make man in our own image, after our likeness; and let them rule over the fish of the sea and the birds of the air, and over the herbivora and over all the land. So God created man in his own image; in the image of God created he him; male and female created he them. And God blessed them, and God said be fruitful and multiply and replenish the earth, and subdue it; and have dominion over the fish of the sea and over the fowl of the air; and over every living thing that moveth upon the earth."

"And God said, behold I have given you every herb bearing seed which is upon the face of all the earth, and every tree in which is the fruit of a tree yielding seed; to you it shall be for food, and to every beast of the earth and to every fowl of the air, and to every thing that creepeth upon the earth wherein there is life, I have given every green herb for meat, and it was so. And God saw everything that he had made, and behold it was very good. And evening and morning were the sixth day."

The creation of man is prefaced by expressions implying deliberation and care. It is not said "let the earth bring forth" man, but let us form or fashion man. This marks the relative importance of the human species, and the heavenly origin of its nobler immaterial part. Man is also said to have been "created," implying that in his constitution there was something new and not included in previous parts of the work, even in its material. Man was

created, as the Hebrew literally reads, the shadow and similitude of God—the greatest of the visible manifestations of deity in the lower world,—the reflected image of his Maker, and under the Supreme Lawgiver, the delegated ruler of the earth. Now for the first time was the earth tenanted by a being capable of comprehending the purposes and plans of Jehovah, of regarding his works with intelligent admiration, and of shadowing forth the excellences of his moral nature. For countless ages the earth had been inhabited by creatures wonderful in their structures and instincts, and mutely testifying, as their buried remains still do, to the Creator's glory; but limited within a narrow range of animal propensities, and having no power of raising a thought or aspiration toward the being who made them. Now, however, man enters on the scene, and the Sons of God, who had shouted for joy when the first land emerged from the bosom of the deep, saw the wondrous spectacle of a spiritual nature analogous to their own, united to a corporeal frame constructed on the same general type with the higher of those irrational creatures whose presence on earth they had so long witnessed.

Man was to rule over the fish of the sea, the birds of the air and the *bhemah* or herbivorous animals. The carnivorous creatures are not mentioned, and possibly were not included in man's dominion. We shall find an explanation of this farther on. The nature of man's dominion we are left to infer. In his state of innocence it must have been a mild and gentle sway, interfering in no respect with the free

exercise of the powers of enjoyment bestowed on animals by the Creator, a rule akin to that which a merciful man exercises over a domesticated animal, and which some animals are capable of repaying with a warm and devoted affection. Now, however, man's rule has become a tyranny. "The whole creation groans" because of it. He desolates the face of nature wherever he appears, unsettling the nice balance of natural agencies, and introducing remediless confusion and suffering among the lower creatures, even when in the might of his boasted civilization he professes to renovate and improve the face of nature. He retains enough of the image of his maker to enable him to a great extent to assert his dominion, and to aspire after a restoration of his original paradise, but he has lost so much that the power which he retains is necessarily abused to selfish ends.

Man, like the other creatures, was destined to be fruitful and multiply and replenish the earth. We are also informed in chapter second that he was placed in a "garden," a chosen spot in the alluvial plains of Western Asia, belonging to the later geological formations, and thus prepared by the whole series of prior geological changes, replenished with all things useful to him, and containing nothing hurtful, at least in so far as the animal creation was concerned. These facts, taken in connection, lead to grave questions. How is the happy and innocent state of man consistent with the contemporaneous existence of carnivorous and predaceous animals, which, as both scripture and geo-

logy state, were created in abundance in the sixth day. How, when confined to a limited region, could he increase and multiply and replenish the earth? These questions, which have caused no little perplexity, are easily solved when brought into the light of our modern knowledge of nature. 1. Every large region of the earth is inhabited by a group of animals, differing in the proportions of identical species and in the presence of distinct species, from the groups inhabiting other districts. There is also sufficient reason to conclude that all animals and plants have spread from certain local centres of creation, in which certain groups of species have been produced and allowed to extend themselves, until they met and became intermingled with species extending from other centres. Internal probabilities, as well as the tracing of many important species to this source, show that the district of Asia in the vicinity of the Euphrates and Tigris, to which the scripture assigns the origin of the human race, was an eminent centre of this description; and at the period under consideration, it may either have been cleared of its previous inhabitants, or may not have yet been invaded by animals spreading from other centres.* 2. To remove all zoological difficulties from the position of primeval man in his state of innocence, we have but to suppose, in accordance with all the probabilities of the case, that man was created along with a group of creatures adapted to contribute to

* See Appendix H.

his happiness, and having no tendency to injure or annoy; and that it is the formation of these creatures—the group of his own centre of creation—that is especially noticed in Genesis 2d and 19th, *et seq.*, where God is represented as forming them out of the ground and exhibiting them to Adam; a passage otherwise superfluous, and indeed tending to confuse the meaning of the document. 3. The difficulty attending the extension of the human race in a state of innocence, is at once obviated by the geological doctrine of the extinction of species. We know that in past geological periods large and important groups of species have become extinct, and have been replaced by new groups extending from new centres; and we know that this process has removed, in early geological periods, many creatures that would have been highly injurious to human interests had they remained. Now, the group of species created with man being the latest introduced, we may infer, on geological grounds, that it would have extended itself within the spheres of older zoological and botanical districts, and would have replaced their species, which, in the ordinary operation of natural laws, may have been verging toward extinction. Thus, not only man, but the Eden in which he dwelt, with all its animals and plants, would have gradually encroached on the surrounding wilderness, until man's happy and peaceful reign had replaced that of the ferocious beasts that preceded him in dominion, and had extended at least over all the temperate region of the earth. 4. The cursing of the ground for man's sake, on his fall

from innocence, would thus consist in the permission given to the predaceous animals and the thorns and the briars, of other centres of creation, to invade his Eden; or, in his own expulsion, to contend with the animals and plants which were intended to have given way and become extinct before him. Thus the fall of man would produce an arrestment in the progress of the earth, in that last great revolution which would have converted it into an Eden; and the anomalies of its present state consist, according to scripture, in a mixture of the conditions of the tertiary with those of the human period. 5. Though there is good ground for believing that man was to have been exempted from the general law of mortality, we cannot infer that any such exemption would have been enjoyed by his companion animals; we only know that he himself would have been free from all annoyance, and injury, and decay, from external causes. We may also conclude, that, while Eden was sufficient for his habitation, the remainder of the earth would continue, just as in the earlier tertiary periods, under the dominion of the predaceous mammals, reptiles, and birds. 6. The above views enable us on the one hand to avoid the difficulties that attend the admission of predaceous animals into Eden, and on the other the still more formidable difficulties that attend the attempt to exclude them altogether from the Adamic world. They also illustrate the geological fact that many animals, contemporaneous with man, extend far back into the tertiary period. These are creatures not belonging to the Edenic centre of crea-

tion, but introduced in an earlier part of the sixth day, and now permitted to exist along with man in his fallen state. I have stated these supposed conditions of the Adamic creation briefly, and with as little illustration as possible, that they may connectedly strike the mind of the reader. Each of these statements is in harmony with the scriptural narrative on the one hand, and with geology on the other; and, taken together, they afford an intelligible history of the introduction of man. If a geologist were asked to state, *a priori*, the conditions proper to the creation of any important species, he could only say—the preparation or selection of some region of the earth for it, and its production along with a group of plants and animals suited to it. These are precisely the conditions implied in the scriptural account of the creation of Adam.* The difficulties of the subject have arisen from supposing, contrary to the narrative itself, that the conditions necessary for Eden must in the first instance have extended over the whole earth, and that the creatures with which man is in his present dispersion brought into contact, must necessarily have been his companions there.

The food of animals is specified at the close of the work of this day. The grant to man is every herb bearing seed, and every fruit tree. That to the lower animals is more extensive — every green herb. This cannot mean that every animal in the earth was herbivorous. It may refer

* See Lyell, Principles of Geology, "Introduction of Species."

to the group of animals associated with man in Eden; or, if it includes the animals of the whole earth, we may be certain, from the express mention of carnivorous creatures in the work of the fifth and sixth days, that it indicates merely the general fact that the support of the whole animal kingdom is based on vegetation.

A most important circumstance in connection with the work of the sixth day, is that it witnessed the creation both of man and the mammalia. A fictitious writer would unquestionably have exalted man by assigning to him a separate day, and by placing the whole animal kingdom together in respect to time. He would be all the more likely to do this, if unacquainted, as most ignorant persons, as well as many literary men are, with the importance and teeming multitudes of the lower tribes of animals, and with the typical identity of the human frame with that of the higher animals. He has not done so, we are at liberty to suppose, because the fact as revealed to him was otherwise; and modern geology has amply vindicated him in this, by its disclosure of the intimate connection of the human with the tertiary period; and has shown in this as in other instances that truth and not "accommodation" was the object of the sacred writer. While, as already stated, many existing species extend far back into the tertiary period, showing that the earth has been visited by no universal catastrophe since the first creation of mammals; on the other hand, we cannot with certainty trace any existing species back beyond the commencement of the tertiary era.

Geology and revelation, therefore, coincide in referring the creation of man to the close of the period in which mammals were introduced and became predominant, and in establishing a marked separation between that period and the preceding one in which the lower animals held undisputed sway. This coincidence, while it strengthens the probability that the creative days were long periods, opposes an almost insurmountable obstacle to every other hypothesis of reconciliation with geological science.

At the close of this day, the Creator again reviews his work and pronounces it good. Step by step the world had been evolved from a primeval chaos, through many successive physical changes, and long series of organised beings. It had now reached its acme of perfection, and had received its most illustrious tenant, possessing an organism excelling all others in majesty and beauty, and an immaterial soul the shadow of the glorious Creator himself. Well might the angels sing, when the long protracted work was thus grandly completed:—

——— "Thrice happy man
And sons of men, whom God hath thus advanced,
Created in his image, there to dwell
And worship him, and in reward to rule
Over his works in earth, or sea, or air,
And multiply a race of worshippers
Holy and just; thrice happy, if they know
Their happiness and persevere upright."

The Hebrew idea of the golden age of Eden is pure and

exalted. It consists in the enjoyment of the favour of God, and of all that is beautiful and excellent in his works. God and nature are the whole. Nor is it merely a rude, unintelligent, sensuous enjoyment. Man primeval is not a lazy savage gathering acorns. He is made in the image of the Creator; he is to keep and dress his garden, and it is furnished with every plant good for food and pleasant to the sight. Alas for fallen man, with his poor civilization gathered little by little from the dust of earth, and his paltry art that halts immeasurably behind nature. How little is he able even to appreciate the high estate of his great ancestor. The world of fallen men has worshipped art too much, reverenced and studied nature too little. The savage displays the lowest taste when he admires the rude figures which he paints on his face or his garments, more than the glorious painting that adorns nature: yet even he acknowledges the preëminent excellence of nature, by imitating her forms and colors, and by adapting her painted plumes and flowers to his own use. There is a wide interval, including many gradations, between this low position and that of the cultivated amateur or artist. The art of the latter makes a nearer approach to the truly beautiful, inasmuch as it more accurately represents the geometric and organic forms, and the coloring of nature; and inasmuch as it devises ideal combinations not found in the actual world; which ideal combinations, however, are beautiful or monstrous, just as they realize or violate the harmonies of nature. It is only the highest culture that brings man back to his primitive refinement.

I do not wish here so to depreciate art, as to raise the question—why should there be such a thing as fine art? Why we should attempt to imitate that which we cannot equal, and which yet every where surrounds us? The necessities of man's fallen nature,—his desire to perpetuate the perishing forms dear to him,—his own conceptions of the beautiful, and his longing to realize them,—his ambitious wish to create something that may give him an undying reputation,—his idolatrous desire to embody in material form, something that he or others may reverence or worship; these and such reasons are sufficient to account for art aspirations, as constant products of our mental constitution. Let us accord to art the admiration which it deserves, but let us not forget that nature is the highest art—*the* art which embraces in itself all else that truly deserves the name.

One essential difference between imitative art and nature, is that the former is wholly superficial, while the latter has an inner life and finer structure, corresponding to its outward form. The painter's bouquet of flowers may charm us with its fine combination of forms and colors, and with the thought and taste that speak in every hue and tint; but examine it closely, and it becomes a mass of patches of color, in which the parts of the actual flower are but rudely shadowed forth. The natural flower, on the other hand, yields to the closest examination, only new structures and more delicate beauties not perceived at the first glance; and even under the microscope, we find it pregnant with

new wonders, so that if we represent separately all its various parts and internal structures, we have a series of pictures, each full of beauty and interest, and the whole showing us that the painter's genius has availed only to depict that outer layer of charms which lies at the very surface. And then in the actual flower, we have all those changes of beauty that march in procession from the unfolding bud to the ripening fruit. Truly may the lily of the field laugh to scorn the efforts of human art, when we place them in competition as objects addressed to our higher powers and tastes.

In like manner the Apollo of the Sculptor may represent, not only years of study and laborious days of delicate chiseling, but also a beau-ideal of manly symmetry and grace, such as we can seldom find approached in the real world; but take, for comparison, the living, well-developed human form, and you have an object infinitely more full of beauty. Every motion of such a form is a new statue. In a few minutes it gives you a whole gallery of varied attitudes; and then within, you have the wondrous mechanism of bones and muscles, which, if not individually beautiful, become so to our inner mental vision, when we consider their adaptation to this infinity of graceful form and motion. The frame contrived to enshrine the immortal mind of man, is the chief of the works of God known to us; and is not the less beautiful, that, in our present fallen state, considerations, both moral and physical, require that the nakedness, which was its primeval glory and dis-

tinction, should be covered from our sight. It is a high ambition that fires the sculptor with the hope, that he shall be able to embody even one of those attitudes that speak the emotions of the soul within. Yet, after he has exhausted all his art, how cold, how dead, how intensely wearisome and monotonous, when compared with the living form, is the changeless beauty of the statue. The littleness of art is equally apparent when it attempts to rival the grandeur of nature. Her towers and spires have less effect than those rocky pinnacles and mountain peaks; her pillared porticos do not equal nature's colonnades of stately trunks and graceful foliage. We habitually acknowledge this, when we adorn our finest buildings with surrounding trees, just as nature masks with foliage the bases of rude cliffs, and the flanks of precipices.

Art takes her true place when she sits at the feet of nature, and brings her students to drink in its beauties, that they may endeavor, however imperfectly, to reproduce them. On the other hand, the student of nature must not content himself with "writing Latin names on white paper," wherewith to label nature's productions, but must rise to the contemplation of the order and beauty of the Cosmos. Both will thus rise to that highest taste, which will enable them to appreciate not only the elegance of individual forms, but their structure, their harmonies, their grouping and their relations, their special adaptation, and their places as parts of a great system. Thus art will attain that highest point in which it displays original

genius, without violating natural truth and unity, and nature will be regarded as the highest art.

Much is said and done in our time, with reference to the cultivation of popular taste for fine art as a means of civilization; and this, so far as it goes, is well: but the only sure path to the highest taste-education, is the cultivation of the study of nature. This is also an easier branch of education, provided the instructors have sufficient knowledge. Good works of art are rare and costly; but good works of nature are everywhere around us, waiting to be examined. Such education, popularly diffused, would react on the efforts of art. It would enable a widely extended public to appreciate real excellence, and would cause works of art to be valued just in proportion to the extent to which they realize or deviate from natural truth and unity. I do not profess to speak authoritatively on such subjects, but I confess that the strong impression on my mind is, that neither the revered antique models, nor the practice and principles of the generality of modern art reformers, would endure such criticism; and that if we could combine popular enthusiasm for art, with scientific appreciation of nature, a new and better art might arise from the union.

I may appear to dwell too long upon this topic; but my excuse must be, that it leads to a true estimate both of natural history and of the Hebrew literature. The study of nature guides to those large views of the unity and order of creation, which alone are worthy of a being of the rank

of man, and which lead him to adequate conceptions of the Creator. The truly wise recognize three grades of beauty. First, that of art, which, in its higher efforts, can raise ordinary minds far above themselves. Secondly, that of nature, which, in its most common objects, must transcend the former, since its artist is that God, of whose infinite mind the genius of the artist is only a faint reflection. Thirdly, that pre-eminent beauty of moral goodness, revealed only in the spiritual nature of the Supreme. The first is one of the natural resources of fallen man in his search for happiness. The second was man's joy in his primeval innocence. The third is the inheritance of man redeemed. It is folly to place these on the same level. It is greater folly to worship either or both of the first, without regard to the last. It is true wisdom to aspire to the last, and to regard nature as the handmaid of piety, art as but the handmaid of nature.

Nature to the unobservant, is merely a mass of things more or less beautiful or interesting, but without any definite order or significance. An observer soon arrives at the conclusion that it is a series of circling changes, ever returning to the same points, ever renewing their courses, under the action of invariable laws. But if he rests here, he falls infinitely short of the idea of the Cosmos; and stands on the brink of the profound error of eternal succession. A little further progress conducts him to the inviting field of special adaptation and mutual relation of things. He finds that nothing is without its use; that

every structure is most nicely adjusted to special ends; that the supposed ceaseless circling of nature is merely the continuous action of great powers, by which an infinity of utilities are worked out—the great fly wheel, which, in its unceasing and at first sight apparently aimless round, is giving motion to thousands of reels and spindles and shuttles, that are spinning and weaving, in all its varied patterns, the great web of life.

But the observer as he looks on this web, is surprised to find that it has in its whole extent a wondrous pattern. He rises to the contemplation of type in nature, a great truth to which science has only lately opened its eyes. He begins dimly to perceive that the Creator has from the beginning had a plan before his mind, that this plan embraced various types or patterns of existence; that on these patterns he has been working out the whole system of nature, adapting each to all the variety of uses, by an infinity of minor modifications. That in short, whether he study the eye of a gnat, or the structure of a mountain chain, he sees not only objects of beauty and utility, but parts of far-reaching plans of infinite wisdom, by which all objects, however separated in time or space, are linked together.

How much of positive pleasure does that man lose who passes through life absorbed with its wants and its artificialities, and regarding with a "brute, unconscious gaze," the grand revelation of a higher intelligence in the outer world. It is only in an approximation through our Divine Redeemer to the moral likeness of God, that we can be

truly happy; but of the subsidiary pleasures which we are here permitted to enjoy, the contemplation of nature is one of the best and purest. It was the pleasure, the show, the spectacle prepared for man in Eden, and how much true philosophy and taste shine in the simple words, that in that paradise, God planted trees "pleasant to the sight," as well as "good for food." Other things being equal, the nearer we can return to this primitive taste, the greater will be our sensuous enjoyment, the better the influence of our pleasures on our moral nature, because they will then depend on the cultivation of tastes at once natural and harmless, and will not lead us to communion with, and reverence for, merely human genius, but will conduct us into the presence of the infinite perfection of the Creator.

The Bible knows but one species of man. It is not said that men were created after their species, as we read of the groups of animals. Man was made, "male and female"; and in the succeeding more full details given in the second chapter—where the writer, having finished his general narrative, commences his special history of man—but one primitive pair is introduced to our notice. We scarcely need the detailed tables of affiliation afterwards given, or the declaration of the Apostle who preached to the supposed autochthones of Athens, that "God has made of one blood all nations," to assure us of the scriptural unity of man. If, therefore, there really is good reason to believe with some modern naturalists, that man is not of one but several origins, we must admit Moses to have been

very imperfectly informed. Nor, on the other hand, does the Bible allow us to assign a very high antiquity to the origin of man. Its careful genealogical tables admit of but very narrow limits of difference of opinion as to the age of the human world or aeon; and especially of the deluge, from which man took his second point of departure. These questions, so much agitated now, demand a separate and careful consideration; but we must first devote a few pages to the simple statements of the Bible respecting the Sabbath of creation, and its relation to human history.

CHAPTER XV.

THE REST OF THE CREATOR.

GENESIS ii. 1 and 3: "And the heavens and the earth were finished, and all the host of them. And on the seventh day God ended his work which he had made, and he rested on the seventh day from all his work which he had made. And God blessed the seventh day and sanctified it, because that in it God rested from all his work which he had created to make."

THE end of the sixth day closed the work of creation properly so called, as well as that of forming and arranging the things created. The beginning of the seventh introduced a period, which, according to the views already stated, was to be occupied by the continued increase and diffusion of man and the creatures under his dominion, and by the gradual disappearance of tribes of creatures unconnected with his well-being.

Science in this well accords with scripture. No proof exists of the production of a new species since the creation of man; and geological evidence points to him and a few of the higher mammals as the newest of the creatures. There is, on the other hand, good evidence that several species have become extinct since his creation. Some geologists, it is true, are not prepared to admit that new species have not been created during the human era; but they do not maintain that any positive evidence of such creation exists. Others strongly contend, that the negative

evidence is sufficiently perfect to warrant us in affirming that the creation terminated in man. Perhaps on this subject no authority is better than that of the late Prof. E. Forbes—a most careful observer and accurate reasoner on the more recent changes of the earth's surface. He infers, from the distribution of species from their centres of creation, that man is the latest product of creative power; or, in other words, that none of those species or groups of species which he had been able to trace to their centres, or the spots at which they probably originated, appear to be of later or as late origin as man. "This consideration," he says, "induces me to believe that the last province in time was completed by the coming of man, and to maintain an hypothesis that man stands unique in space and time, himself equal to the sum of any pre-existing centre of creation or of all, an hypothesis consistent with man's moral and social position in the world."

The seventh day, then, was to have been that in which all the happiness, beauty and perfection of the others were to have been concentrated. But an element of instability was present, in the being who occupied the summit of the animal scale. Not regulated by blind and unerring instincts, but a free agent, with a high intellectual and moral nature, and liable to be acted on by temptation from without; under such influence, he lost his moral balance, in stretching out his hand to grasp the peculiar powers of deity, and fell beyond the hope of self-redemption—perpetuating, by one of those laws which regulate the transmission of mixed

corporeal and spiritual natures, his degradation to every generation of his species. And so God's great work was marred, and all his plans seemed to be foiled, when they had just reached their completion. Thus far science might carry us unaided; for there is not a true naturalist, however, skeptical as to revealed religion, who does not feel in his inmost heart, the disjointed state of the present relations of man to nature; the natural wreck that results from his artificial modes of life, the long trains of violations of the symmetry of nature that follow in the wake of his most boasted achievements. But here natural science stops; and just as we have found that, in tracing back the world's history, the Bible carries us much farther than geology, so science, having led us to suspect the fallen state of man, leaves us henceforth to the teaching of revelation. And how glorious that teaching! God did not find himself baffled—his resources are infinite—he had foreseen and prepared for all this apparent evil; and out of the moral wreck he proceeds to work out the grand process of *redemption*, which is the especial object of the seventh day, and which will result in the production of a new heaven and a new earth wherein dwelleth righteousness. In the seventh, as in the former days, the evening precedes the morning. For four thousand years the world groped in its darkness,—a darkness tenanted by moral monsters as powerful and destructive as the old pre-adamite reptiles. The Sun of Righteousness at length arose, and the darkness began to pass away; but eighteen centuries have elapsed,

and we still see but the gray dawn of morning, which we yet firmly believe will brighten into a glorious day that shall know no succeeding night.*

The seventh day is the modern or human era in geology; and, though it cannot yet boast of any physical changes so great as those of past periods, it is still of great interest, as affording the facts on which we must depend for explanations of past changes; and as immediately connected in time with those later tertiary periods which afford so many curious problems to the geological student. This last subject is still involved in some obscurity, though there are no geological reasons for assigning to man any greater antiquity than that of the Bible chronology.† I shall, therefore, in this place notice some general facts deducible from the Bible, and which may be useful in appreciating the true relation of the human era to those which preceded it.

1. The local centre of creation of the human species, and probably of a group of creatures coeval with it, was Eden; a country of which the scriptures give a somewhat minute geographical description. It was evidently a district of Western Asia; and, from its possession of several important rivers, rather a region or large territory than a limited spot, such as many, who have discussed the question of the site of Eden, seem to suppose. In this view

* For an exposition of the details of the fall, I beg to refer the reader to McDonald's "Creation and the Fall," to Kitto's "Antediluvians and Patriarchs," and Kurtz's "History of the Old Covenant."

* Appendix L.

it is a matter of no moment to fix its site more nearly than the indication of the Bible that it included the sources and probably large portions of the valleys of the Tigris, the Euphrates, and perhaps the Oxus and Jaxartes. Into the minor difficulties respecting the site of Eden it would be unprofitable to enter. I may merely mention one, because it throws light on the great antiquity of this geographical description, and has been strangely mystified by expositors,—the relation of those rivers to Cush or Ethiopia, and Havilah a tribe name derived from that of a grandson of Cush. On consulting the tenth chapter of Genesis, it will be found that the Cushites under Nimrod, very soon after the deluge, pushed their migrations and conquests along the Tigris to the northward, and established there the first empire. It is probably this primitive Cushite empire which, in the epoch of the description of Eden, was limited to the north by the Oxus, and was believed to extend over the old site of Eden; an interesting coincidence, throwing light on many obscure points in the early history of man; and since this Cushite empire had perished even before the time of Moses, indicating a still more ancient tradition respecting the primeval abode of our species.

2. Before the deluge this region must have been the seat of a dense population, which, according to the biblical account, must have made considerable advances in the arts, and at the same time sunk very low in moral debasement.*

* The Bible specifies, perhaps only as the principal of these arts, music and musical instruments by Jubal, metallurgy by

Whether any remains of this ancient population or its works exist, will probably not be determined with certainty, till we have accurate geological investigations of the whole country in the neighbourhood of the Caspian Sea, and along the great rivers of western Asia. Should such remains be found, we may infer, from the extreme longevity assigned to the antediluvians, that their skeletons would present peculiarities entitling them to be considered a very well-marked variety of the human species.* We may also infer that the family of man very early divided into two races—one retaining in greater purity the moral endowments of the species, the other excelling in the mechanical and fine arts; and that a subsequent mixture of these tribes produced, as generally occurs in such cases, a race excelling both in energy and physical endowments—the "giants"—mighty men of violence—that were in those

Tubalcain, the domestication of cattle and the nomade life by Jabal. It is highly probable that these inventors are introduced into the Mosaic record for a theological reason, to point out the folly of the worship rendered to Phtha, Hephaestos, Vulcan, Horus, Phœbus, and other inventors, either traditionary representatives of the family of Lamech, or other heroes wrongly identified with them. Very possibly their sister Naamah, "the beautiful," is introduced for the same reason, as the true original of Ashtaroth, Diana, Aphrodite, and other female deities of the heathen.

* Should such remains be found, it would not be at all surprising to find many anatomists recognising in them the relics of a new and extinct species of man.

days.* If any undoubtedly antediluvian remains are ever discovered, we may confidently anticipate that the distinctive characteristics of these races may be detected in their osseous structures as well as in their works of art. Farther, it is to be inferred from notices in the fourth chapter of Genesis, that before the deluge there was both a nomadic and a citizen population, and that the principal seat of the Cainite, or more debased yet energetic branch of the human family, was to the eastward of the site of Eden. No intimations are given by which the works of art of antediluvian times could be distinguished from those of later periods, except the presumption, based on negative evidence, that no mode of writing had been invented previous to the deluge.

3. When the antediluvian population had fully proved itself unfit to enter into the divine scheme of moral renovation, it was swept away by a fearful physical catastrophe. The deluge might, in all its relations, furnish material for an entire treatise. I may remark here, as its most important geological peculiarity, that it was evidently a *local* convulsion. The object, that of destroying the human race and the animal population of its peculiar centre of creation, the preservation of specimens of these creatures in the ark, and the physical requirements of the case, shut us up to this conclusion, which is now accepted by the best

* I cannot for a moment entertain the monstrous supposition of many expositors, that the "sons of God" of these passages are angels, and the Nephelim hybrids between angels and men.

biblical expositors,* and which inflicts no violence on the terms of the record. Viewed in this light, the phenomena recorded in the Bible, in connection with geological probabilities, lead us to infer that the physical agencies evoked by the Divine power to destroy this ungodly race, were a subsidence of the region they inhabited, so as to admit the oceanic waters, and extensive atmospherical disturbances connected with that subsidence, and perhaps with the elevation of neighbouring regions.† In this case it is possible that the Caspian Sea, which is now 160 feet below the level of the ocean, and which was probably much more extensive then than at present, received much of the drainage of the flood, and that the mud and sand deposits of this sea and the adjoining desert plains, once manifestly a part of its bottom, conceal any remains that may exist of the antediluvian population. In connection with this, it may be remarked that, in the Book of Job, Eliphaz speaks as if the locality of those wicked nations which existed before the deluge, was known and accessible in his time:—

> "Hast thou marked the ancient way
> Which wicked men have trodden,
> Who were seized (by the waters) in a moment,
> And whose foundations a flood swept away?"
>
> *Job* xxii. 15.

On comparing this statement with the answer of Job in the

* See King's "Geology and Religion"; also Hitchcock, and Dr. J. P. Smith.

† See Appendix H.

26th chapter, verse 5th, it would seem that the ungodly antediluvians were supposed to be still under the waters; a belief quite intelligible if the Caspian, which, on the latest and most probable views of the locality of the events of this book, was not very remote from the residence of Job,* was supposed to mark the position of the pre-Noachic population, as the Dead Sea afterwards did that of the cities of the plain. Some of the dates assigned to the book of Job would, however, render it possible that this last catastrophe is that to which *he* refers:—

> "The *Rephaim* tremble from beneath
> The waters and their inhabitants.
> Sheol is naked before him,
> And destruction hath no covering."

The word Rephaim here has been variously rendered "shades of the dead" and "giants." It is properly the family or national name of certain tribes of gigantic Hamite men, (the Anakim, Emim, &c.), inhabiting western Asia at a very remote period; and it must here refer either to them or to the still earlier antediluvian giants.†

After the deluge, we find the human race settled in the fertile plains of the Euphrates and Tigris, attracted thither

* Kitto's Bible Illustrations—book of Job.

† See article "Rephaim" in Kitto's Journal of Sacred Literature. But Gesenius and others regard it, not as an ethnic name, but as a term for the "shades" or spirits of the dead. See Conant on Job.

by the fertility of their alluvial soils. There we find them engaging in a great political scheme, no doubt founded on recollections of the old antediluvian nationalities, and on a dread of the evils which able and aspiring men would anticipate from that wide dispersion of the human race, that appears to have been intended by the Creator in the new circumstances of the earth. They commenced accordingly the erection of a city or tower at Babel, in the plain of Shinar, to form a common bond of union, a great public work that should be a rallying-point for the race, and around which its patriotism might concentrate itself. The attempt was counteracted by an interposition of Divine providence;* and thenceforth the diffusion of the human race proceeded unchecked. Out of the enterprise at Babel, however, arose a new type of evil, which, in the forms of military despotism, the spirit of conquest, hero-worship, and the alliance of these influences with literature and the arts, has been handed down through every succeeding age to our own time. The name of Nimrod, the son of Cush, has been preserved to us in the Bible as the first rebel against the primitive patriarchal rule, and the founder of the first despotism. This bold and ambitious man, subsequently deified under different names, established a Cushite empire, which appears to have extended its sway over the tribes occupying south-western Asia and north-eastern Africa, everywhere supporting its power by force of arms, and introducing a debasing polytheistic hero-worship and

* Appendix I.

certain forms of art probably derived from antediluvian times. The centre of this Cushite empire, however, gave way to the rising power of Assyria or the Ashurite branch of the sons of Shem, at a period antecedent to the dawn of profane history, except in its mythical form; and when the light of secular history first breaks on us, we find Egypt standing forth as the only stable representative of the arts, the systems and the superstitions of the old Cushite empire, of which it had been the southern branch; while other remnants of the Hamite races, included in the empire of Nimrod, were scattered over western Asia, and migrating into Europe, with or after the ruder but less demoralised sons of Japheth, carried with them their characteristic civilization and mythology, to take root in new forms in Greece and Italy.* Meanwhile the Assyrian and Persian (Elamite) races were growing in middle Asia, and probably driving the more eastern remnants of the Nimrodic empire into India, borrowing at the same time their superstitions and their claims to universal dominion. These views, which I believe to correspond with the few notices in the Bible and in ancient history, and to be daily

* On the biblical view of this subject, the so-called Arian mythology, common to India and Greece, is either a derivative from the Cushite civilisation, or a spontaneous growth of the Japetic stock scattered by the Cushite empire. The Semitic and Hamitic mythologies are derived from the primeval cherubic worship of Eden, corrupted and mixed with adoration of deified ancestors and heroes. (See Appendix K.)

receiving new confirmations from the investigations of the ancient Assyrian monuments, enable us to understand many mysterious problems in the early history of man. They give us reason to suspect that the *principle* of the first empire was an imitation of the antediluvian world, and that its arts and customs were mainly derived from that source. They show how it happens that Egypt, a country so far removed from the starting-point of man after the deluge, should appear to be the cradle of the arts, and they account for the Hamite and perhaps antediluvian elements, mixed with primeval biblical ideas, as the cherubim, &c., in the old heathenism of India, Assyria and Southern Europe, and which they share with Egypt, having derived them from the same source. They also show how it is that in the most remote antiquity, we find two well developed and opposite religious systems; the pure theism of Noah, and those who retained his faith, and the idolatry of those tribes which regarded with adoring veneration the grander powers and objects of nature, the mighty Cainites of the world before the flood, and the post-diluvian leaders who followed them in their violence, their cultivation of the arts, and their rebellion against God. These heroes were identified with imaginative conceptions of the heavenly bodies, animals, and other natural objects, associated with the fortunes of cities and nations, with particular territories, and with war and the useful arts, transmitted under different names to one country after another, and localised in each; and it is only in compara-

tively modern times, that we have been able to recognise the full certainty of the view held long since by many ingenious writers, that among the greater gods of Egypt and Assyria, and of consequence among those also of Greece and Rome, were Nimrod, Ham, Ashur, Noah, Mizraim, and other worthies and tyrants of the old world; and to suspect that Tubalcain and Naamah, and other antediluvian names, were similarly honoured, though subsequently overshadowed by more recent divinities. The later Assyrian readings of Col. Rawlinson and Dr. Hincks, and the more recent works on Egyptian Antiquities, are full of pregnant hints on these subjects. It would, however, lead us too far from our immediate subject to enter more fully into these questions. I have referred to them merely to point out connecting-links between the secular and sacred history of the earlier part of the human period, as a useful sequel to our comparison of the sacred history with the conclusions of science, and as furnishing hints which may guide the geologist in connecting the human with the tertiary period, and in distinguishing between the antediluvian and post-diluvian portions of the former.

In relation to this last aspect of the subject, we may fairly infer that the regions in which remains of antediluvian nations are most likely (according to the Bible) to be discovered, are the Aralo-Caspian plain, and the skirts of the Caucasus and Elburz mountains, and the valleys of the Tigris and Euphrates. In connection with this, it may be remarked, that there is good geological evidence that both

the Caucasus and the Himmalayah have experienced important elevatory movements in the later tertiary or modern periods, and that in the same periods the Caspian region has been depressed far below its present level.* These movements were possibly connected with the diluvial catastrophe. We may also infer that the oldest remains of post-diluvial population, are to be looked for along the courses of the Euphrates and Tigris, though it is likely that nothing now remains older than the Assyrian dynasties that succeeded the old Cushite empire; or that, if such remains exist, they may be deeply covered by the alluvial deposits of the rivers. Some fortunate discovery in these regions may yet, perhaps, enable us to fix with accuracy the point in geological time at which the human race originated, and its precise relations to the fauna of the later tertiary era.

* See Appendix H.

CHAPTER XVI.

UNITY AND ANTIQUITY OF MAN.

GEN. x. 22 : "These are the families of the sons of Noah, after their generations, in their nations : and by these were the nations divided in the earth after the flood."

THE theologians and evangelical christians of our time, and with them the credibility of the Holy Scriptures, are supposed by many to have been impaled on a zoological and archaeological dilemma, in a manner which renders nugatory all attempts to reconcile the Mosaic cosmogony with science. The Bible, as we have seen, knows but one Adam, and that Adam not a myth or an ethnic name, but a veritable man : but some naturalists and ethnologists think that they have found decisive evidence that man is not of one but of several origins. The religious tendency of this doctrine no christian can fail to perceive. In whatever way put, or under whatever disguise, it renders the Bible history worthless, reduces us to that isolation of race from race cultivated in ancient times by the various local idolatries, and destroys the brotherhood of man and the universality of that christrian atonement which proclaims that "as in Adam all die, so in Christ shall all be made alive."

Fortunately, however, the greater weight of scientific authority is still on the side of the Bible, and philology comes in with strong corroborative evidence. But just as

the orthodox theologian is beginning to congratulate himself on the aid he has thus received, some of his new friends gravely tell him that, in order to maintain their view, it is necessary to believe that man has resided on earth for countless ages, and that it is quite a mistake to suppose that his starting-point is so recent as the Mosaic deluge. Nay, some very rampant theorists of the new American ethnological school, try to pierce Moses and his abettors with both horns of the dilemma at once, maintaining that men are of different species, and that they have existed for an enormous length of time as well.

To sift thoroughly the mass of fact and supposed fact that has been accumulated by the advocates of the plurality of origin and pre-adamite antiquity of man, would demand a treatise of itself; but the question really hinges on a few points. These I shall endeavour to present to the reader as clearly as possible in a single chapter, that he may be able to weigh for himself the influence which they should have on our interpretation of the Bible or belief in its authority. I shall take first the question as to the unity of man, in its zoological aspect.

The last common ground on which all opinions on this subject meet, is the truth that in nature all animals occur in species or "according to their kinds;" these species being according to the Bible direct products of the creative power, and science as yet knows nothing to the contrary of this. From this point the opinions of naturalists diverge. Some maintain that men are of one species and

one origin. Others hold the specific unity in a limited sense, but deny the common origin. Others deny both, erecting the races of men into distinct species. It is the difference here as to the real nature of species that complicates the question in its natural history aspect. If we are content to admit that the individuals of the species in natural history may or may not have had a common origin, we give up not only all the evidence that natural history can afford as to the unity of man, but also as to the creation of any species. We really give up much more, and unsettle the very foundations of natural science; but this does not concern us here. If, on the other hand, it can be shown that the idea of species is necessarily connected with community of origin, we still have to show that the races of men present the characters, not of distinct species, but of varieties of one. We might, it is true, in such a case fairly throw the burden of proof on our opponents, and require them to show, in the case of some considerable number of species, that the individuals of each actually have had different points of origin; and next, that these cases are, in their leading features, parallel to that of man. I prefer, however, the bolder and simpler course, of inquiry as to the positive evidence afforded by species of their unity of origin, and then as to that which connects all the races of man as parts of one species.

I. What, then, are species? Here it must be observed, that it is much more difficult to give a good definition of species than to assure ourselves of the reality of the exist-

ence of specific forms. Cuvier defined species to be "the collection of all the beings descended the one from the other, or from common parents, and of those which bear as close a resemblance to these as they bear to each other." De Candolle somewhat modifies Cuvier's definition, in form though not in purport, including under one species all the individuals which bear to each other "so close a resemblance as to allow of our supposing that they have proceeded originally from a single being or a single pair." Both these definitions assume continuous descent from a primal form or protoplast; and this view Dr. Morton, with a special application to the human race, has sought to express by defining species to be a group of individuals descended from a "primordial organic form." Other naturalists, wishing to avoid, on the one hand, the hypothesis of descent from a single pair, and on the other the obscurity arising from the question of the origin of primordial forms, have sought to frame a definition based simply on the created origin and observed properties of species. The most successful of these is, perhaps, that of Prof. Dana,* who defines species to be, "a specific amount or condition of concentrated force defined in the act or law of creation"; a definition which, without stating it in terms, fully implies all that is demanded by that of Cuvier. But this and all similar attempts have an abstract character which separates them very widely from the facts with which natural-

* Thoughts on Species, Silliman's Journal.

ists work in determining species. This and the previous difficulties Prof. Agassiz attempts to overcome by a definition which assumes nothing, and confines itself to the mere apparent differences and resemblances. He regards a species as consisting of individuals distinguished by their relations "to one another and the world in which they live, as well as by the proportions of their parts, their ornamentation," &c.† This definition is so vague that it allows room even to infer that the same species may have originated from many protoplasts scattered in different places. It amounts, indeed, to little more than an admission that we cannot define species without including with the observed facts the deductions as to unity of origin to which they lead.

Let us inquire, then, how naturalists determine species, that we may if possible learn from this what is the real nature of the specific unit.

We can determine species only by the comparison of individuals. If all these agree in all their characters except those appertaining to sex, age, and other conditions of the individual merely, we say that they belong to the same species. If all species were invariable to this extent, there could be no practical difficulty, except that of obtaining specimens for comparison. But in the case of very many species there are minor differences, not sufficient to establish specific diversity, but to suggest its possibility; and in such cases there is often great liability to error. In

† Contributions to Natural History of America, Vol. 1.

cases of this kind we have principally two criteria; first, the nature and amount of the differences; secondly, their shading gradually into each other, or the contrary. Under the first of these we inquire:—Are they no greater in amount than those which may be observed in individuals of the same parentage? Are they no greater than those which occur in other species of similar structure or habits? Do they occur in points known in other species to be readily variable, or in points that usually remain unchanged? Are none of them constant in the one supposed species, and constantly absent in the other? Under the second we ask—Are the individuals presenting these differences connected together by individuals showing a series of gradations uniting the extremes by minute degrees of difference? If we can answer these questions —or such of them as we have the means of answering—in the affirmative, we have no hesitation in referring all to the same species. If obliged to answer all or many in the negative, we must at least hesitate in the identification; and if the material is abundant, and the distinguishing characters clear and well defined, we conclude that there is a specific difference.

Species determined in this way must possess certain general properties in common:

1. Their individuals must fall within a certain range of uniform characters, wider or narrower in the case of different species.

2. The intervals between species must be distinctly marked, and not slurred over by intermediate gradations.

3. The specific characters must be invariably transmitted from generation to generation, so that they remain equally distinct in their limits if traced backward or forward in time.

4. Within the limits of the species there is more or less liability to variation; and this though perhaps developed by external circumstances, is really inherent in the species, and must necessarily form a part of its proper description.*

These general properties of species will, I think, be admitted by all naturalists as based on nature, and absolutely necessary to the existence of natural history as a science.†

* See, for farther illustration of these views, Agassiz "Contributions to Natural History of America," vol 1, p. 51; Dana, "Thoughts on Species," Proceedings American Association and Silliman's Journal, 1856; Carpenter, "Varieties of Mankind, Todd's Cyclopedia; Pritchard, "Natural History of Man."

† Certain views expressed by Mr. C. Darwin and Mr. Wallace in the Linnean Transactions for 1858, may be regarded as hostile to some of the general principles stated in the text, and as almost amounting to a revival of those exploded Lamarckian ideas of the transmutation of species, which are the extreme opposite of the views of Agassiz; and yet, as often happens in such cases, meet them at certain points. I have seen only abstracts of these papers, but I believe Mr. Darwin's view to extend no farther than the assertion that within the limits of variation of a species there will be some varieties more capable of continuous propagation and subsistence than others; and that these last will die out, so that the species will ultimately be represented, not by its typical form, but by a variety. This does not affect the question of the nature of species; and, in so far as it

I now proceed to give a similar summary of the laws of the varieties which may exist—always, be it observed, within the limits of the species.

1. The limits of variation are very different in different species. There are many in which no well-marked variations have been observed. There are others in which the variations are so great that they have been divided, even by skilful naturalists, into distinct species or even genera. I do not here refer to differences of age and sex. These in many animals are so great that nothing but actual knowledge of the relation that subsists, would prevent the individuals from being entirely separated from one another. I refer merely to the varieties that exist in adults of the same sex, including, however, those that depend on arrest of development, and thus make the adult of one variety

is true, perhaps means merely that since variability is a means of accommodation to physical changes, the species will follow the pressure of these as far as its elasticity permits. Mr. Wallace goes farther, and, because some species can vary very far from their original type, supposes that such variation may be indefinite. This assumption, for it can be nothing else, involves consequences in the indefinite gradation of specific forms which are contrary to all experience. I do not, therefore, think it necessary to resume here the controversies about unlimited variation and development which were urged some time since, and are now being supplanted by an opposite tendency equally unsafe, which, while professing great nicety as to specific determination, threatens to break down the distinction of species in another way. (See Appendix F.)

resemble in some respects the young of another; as, for instance, in the hornless oxen, and beardless individuals in man. If we inquire as to the causes on which the greater or less disposition to vary depend, we must, in the first place, confess our ignorance, by saying that it appears to be in a great measure constitutional, or dependent on minute and as yet not distinctly appreciable structural, physiological, and psychical characters. We know, however, very well, certain properties of species that are always or usually connected with great liability to variation. The principal of these are the following:—1. The liability to vary is, in many cases, not merely a specific peculiarity; it is often general in the members of a genus or family. Thus the cats, as a family, are little prone to vary; the wolves and foxes very much so. 2. Species that are very widely distributed over the earth's surface are usually very variable. In this case the capacity to vary probably adapts the creature to a great variety of circumstances, and so enables it to be widely distributed. It must be observed here that hardiness and variability of constitution are more important to extensive distribution than mere locomotive powers, for matters have evidently been so arranged in nature, that, where the habitat is suitable, colonists will find their way to it, even in the face of difficulties almost insurmountable. 3. Constitutional liability to vary is sometimes connected with or dependent on extreme simplicity of structure, in other cases on a high degree of intelligence and consequent adaptation to various modes

of subsistence. Those minute, simply organised, and very variable creatures, the Foraminifera, exemplify the first of these apparent causes; the crafty wolves furnish examples of the second. 4. Susceptibility to variation is farther modified by the greater or less adaptability of the digestive and locomotive organs to varied kinds of food and habitat. The monkeys, intelligent, imitative, and active, are nevertheless very limited in range and variability, because they can comfortably subsist only in forests, and in the warmer regions of the earth. The hog, more sluggish and less intelligent, has an omnivorous appetite, and no very special requirements of habitat, and so can vary greatly and extend over a large portion of the earth. Further in connection with this subject, it may be observed that the conditions favourable to variation are also in the case of the higher animals favourable to domestication.

2. Varieties may originate in two different ways. In the case of wild animals it is generally supposed that they are gradually induced by the slow operation of external influences; but it is certain that in domesticated animals they often appear suddenly and unexpectedly, and are not on that account at all less permanent. A large proportion of our breeds of domestic animals appear to originate in this way. Examples may be found in Pritchard, Roulin, Bachman, and Cabell,* and also in Youatt's treatise on

* Pritchard, "Natural History of Man"; Bachman, "Unity of the Human Race"; Cabell, "Unity of Man."

cattle. A very remarkable instance is that of the "Niata" cattle of the Banda Orientale, described by Darwin in his Voyage of a Naturalist. These cattle are believed to have originated about a century ago among the Indians to the south of the La Plata, and the breed propagates itself with great constancy. "They appear," says Darwin, "externally to hold nearly the same relation to other cattle which bull-dogs hold to other dogs. Their forehead is very short and broad, with the nasal end turned up, and the upper lip much drawn back; their lower jaws project outwards; when walking they carry their heads low on a short neck, and their hinder legs are rather longer compared with the front legs than is usual." It is farther remarkable in respect to this breed that it is, from its conformation of head, less adapted to the severe droughts of those regions than the ordinary cattle, and cannot, therefore, be regarded as an adaptation to circumstances.* Many writers on the subject of the Unity of Man assume that any marked variety must require a long time for its production. Our experience in the case of the domestic

* Darwin informs us that the cattle introduced into the Falkland Islands, have assumed three varieties of colour, which appear to keep themselves distinct. In the same Islands the common rabbit has split into two varieties, one of which has been described as a distinct species. In St. Helena and the Gallipagos the rat has passed into varieties very distinct from the common breeds. All these changes must have occurred within a few generations.

animals teaches the reverse of this view; a very important point in this controversy, too often overlooked.

3. The duration or permanence of varieties is very different. Some return at once to the normal type when the causes of change are removed. Others perpetuate themselves nearly as invariably as species, and are named races. It is these races only that we are likely to mistake for true species, since here we have that permanent reproduction which is one of the characteristics of the species. The race, however, wants the other characteristics of species as above stated; and it differs essentially in having branched from a primitive species, and in not having an independent origin. It is quite evident that in the absence of historical evidence, we must be very likely to err by supposing races to have really originated in distinct "primordial forms." Such error is especially likely to arise, if we overlook the fact of the sudden origination of such races, and their great permanency if kept distinct. There are two facts which deserve especial notice, as removing some of the difficulty in such cases. One is, that well-marked races usually originate only in domesticated animals, or in wild animals which, owing to accidental circumstances, are placed in abnormal circumstances. Another is, that there always remains a tendency to return, in favourable circumstances, to the original type. The domesticated races usually require a certain amount of care to preserve them in a state of purity; both on this account, and on account of the readiness with which they intermix with other varie-

ties of the same species. Many very interesting facts in illustration of these points might be adduced. The domesticated hog differs in many important characters from the wild boar. In South America and the West Indies it has returned, in three centuries or less, to its original form.* The horse is probably not known in a state originally wild, but it has run wild in America and in Siberia. In the prairies of North America, according to Catlin,† they still show great varieties of colour. The same is the case in Sable Island, off the coast of Nova Scotia,‡ where herds of wild horses have existed since an early period in the settlement of America. In South America and Siberia they have assumed a uniform chesnut or bay colour. In the plains of Western America they retain the dimensions and vigour of the better breeds of domesticated horses. In Sable Island they have already degenerated to the level of Highland ponies; but, in all countries where they have run wild, the elongated and arched head, high shoulder, straight back, and other structural characters, probably of the original wild horse, have appeared. We also learn from such instances, that, while races among domesticated animals may appear suddenly, they revert to the original type, when unmixed, comparatively slowly; and this especially when the variation is in the nature of degeneracy.

4. Some characters are more subject to variation than others. We have already ascertained that variation never

* Pritchard. † "North American Indians."

‡ Haliburton's Nova Scotia; Gilpin's Lecture on Sable Island.

proceeds beyond the limits of the species. Consequently it cannot apply to those characters which are distinctive of the genus, or the order or class. But among the characters of the species there are some that are usually little liable to change. In the higher animals variation takes place very readily in the colour and texture of the skin and its appendages. This, from its direct relation to the external world, and ready sympathy with the condition of the digestive organs, might be expected to take the lead. In those domesticated animals which are little liable to vary in other respects, as the cat and duck, the colour very readily changes. Next may be placed the stature and external proportions, and the form of such appendages as the external ear and tail. All these characters are very variable in domestic animals. Next we may place the form of the skull, which, though little variable in the wild state, is nearly always changed by domestication. Psychological functions, as the so-called instincts of animals, are also very liable to change, and to have these changes perpetuated in races. Very remarkable instances of this have been collected by Sir C. Lyell* and Dr. Pritchard. Lastly, important physiological characters, as the period of gestation, &c., and the structure of the internal organs connected with the functions of nutrition, respiration, &c., are little

* Principles of Geology; Natural History of Man. See also a very able article on the Varieties of Man, by Dr. Carpenter, in Todd's Cyclopedia.

liable to change, and remain unaffected by the most extreme variations in other points.

5. Varieties or races of the same species are fully reproductive with each other, which is not the case with true species. Attempts have been made by Dr. Morton and others to prove that mixed races, resulting from the union of individuals of distinct species, have been produced; but, on carefully examining the evidence adduced, I find that the greater part of it consists of very doubtful statements; and that no good case of this exceptional fact has really been made out. Dr. Bachman has, I think, very satisfactorily disproved the allegations offered on this point. Independently of this controversy, however, to which an exaggerated importance has been attached—even by Prof. Agassiz, who writes as if naturalists had based the whole question on this one point,*—there are certain general principles which can scarcely be disputed:—1. Intermixture of distinct species rarely, if ever, occurs freely in nature. It is generally a result of artificial contrivance. 2. Hybrids produced from species known to be distinct, are either wholly barren, or barren *inter se*, reproducing only with one of the original stocks, and rapidly returning to it; or if ever fertile *inter se*, which is somewhat doubtful, rapidly run out. It has been maintained, especially by Dr. Nott and Prof. Agassiz, that there is still another possibility, namely, that of the perfect and con-

* Contributions to the Natural History of America—Section on Species.

tinued fertility of such mixed races; but their only proofs are derived from the intermixture of the races of men, of dogs, and of poultry, all of which are cases actually in dispute at present, as to the original unity or diversity of the so-called species.

II. We next proceed to inquire whether the characters of the races of men are those of distinct species, or only of permanent varieties.

1. It is necessary to premise that the case of man is not that of a wild animal; and that it presents many points of difference even from the case of the domesticated lower animals. According to the Bible history, man was originally fitted to subsist on fruits, to inhabit a temperate climate, and to be exempt from the necessity of destroying or contending with other animals. This view unquestionably accords very well with his organisation. He still subsists principally on vegetable food, is most numerous in the warmer regions of the earth; and, when so subsisting in these regions, is naturally peaceful and timid. On the whole, however, his habits of life are artificial—more so than those of any domesticated animal. He is, therefore, in the conditions most favourable to variation. Again, man possesses more than merely animal instincts. His mental powers permit him to devise means of locomotion, of protection, of subsistence, far superior to those of any mere animal; and his dominant will, insatiable in its desires, bends the bodily frame to uses and exposes it to external influences more various than any inferior animal

can dream of. Man is also more educable and plastic in his constitution than other animals, owing both to his being less hemmed in by unchanging instincts, and to his physical frame being less restricted in its adaptations. If a single species, he is also more widely distributed than any other; and there are even single races which exceed in their extent of distribution nearly all the inferior animals. Nor is there anything in his structure specially to limit him to plains, or hills, or forests, or coasts, or inland regions. All the causes which we can suppose likely to produce variation thus meet in man, who is himself the producer of most of the distinct races that we observe in the lower animals. If, therefore, we condescend to compare man with these creatures, it must be under protest that what we learn from them must be understood with reference to his greater capabilities.

Another point which deserves notice under this head, is that man, whether or not a single species, constitutes a single genus, and this genus the only one of its order. The structural differences between man and the lower animals have always indicated the propriety of constituting a distinct order for man. Professor Owen has very clearly pointed out the enormous width of the space which separates man from the most anthropoid of the apes; and in his admirable new arrangement of the mammals, based on the form and complexity of the brain,* he separates man in the order Archencephala, rightly deciding that his ner-

* Journal of Linnean Society, 1857.

vous centre differs very materially in its structure and the proportions of its parts from that of all other mammals. These facts afford an additional reason for caution in comparing man with the creatures beneath him.

2. The races of man are deficient of some of the essential characters of species. It is true that they are reproduced with considerable permanency; and it has even been asserted that no change whatever can be established. But this is not the fact; though, from the intermixture of races, doubt may be thrown on many of the instances that have been adduced. The Jew, dispersed over all the world, but preserving his race almost unmixed, is fair or xanthous in the north of Europe, of a dark complexion in the south of Europe, and in Malabar, absolutely black. The Arab, in like manner, is fair in the mountains of Yemen; black in Lower Mesopotamia and in Nubia. In both cases the features have experienced less change than the colour. The Magyars of Hungary and the Turks have, however, lost the characteristic Mongolian features of their ancestors and assumed those of Europeans.* The Anglo-American of the United States can already be easily distinguished from the Englishman. The same is the case with the French Canadian. Both, in those districts where they have been little mixed with new European blood, are gradually assuming a cast of feature and skull tending perhaps in some degree to those of the aboriginal American.

* Carpenter, Todd's Cyclo., Pritchard, Latham, Layard. No doubt there have been mixtures more or less in the latter cases.

Similar changes have already been observed in Australia. The Negro population of the United States is now extremely different, both in colour and form, from the low-caste Africans in whom it originated; and the difference is greater than the probable mixture of European blood can account for. Such changes are, however, necessarily slow, and the observation of them is difficult. But the most manifest deficiency in true specific characters, is in the invariable shading-off of one race into another, and in the entire failure of those who maintain the distinction of species, in the attempt accurately to define their number and limits. The characters run into each other in such a manner that no natural arrangement based on the whole can apparently be arrived at; and when one particular ground is taken, as colour, or shape of skull, the so-called species have still no distinct limits; and all the arrangements formed differ from each other, and from the deductions of philology and history. Thus, from the division of Virey into two species, on the entirely arbitrary ground of facial angle, to that of Bory de St. Vincent into fifteen, we have a great number and variety of distinctions, all incapable of zoological definition; or, if capable of definition, eminently unnatural. One of the latest attempts of this kind is contained in an eccentric essay by the late Mr. Gliddon, in the conglomeration of works entitled the "Indigenous Races of the Earth." The essay, "The Monogenists and the Polygenists," is characterised much more by a rabid spirit of hostility to the scriptures than by

scientific precision; but its substance is attempted to be embodied in an "Ethnographic Tableau," exhibiting specimens of the races of mankind, arranged first in the eight "realms" or regions indicated by Prof. Agassiz, and then in no less than sixty-five groups, called "families" by the author. The production is interesting, as exhibiting in a striking manner the difficulty of arriving at a separation of the human race into distinct groups. The rows of heads are intended to be read horizontally; but, if they are traced vertically or diagonally, we find nearly as great coincidences in colour, hair, feature, and skull, as in the direction intended to mark out the specific realms or families. The whole—if the representations could be relied on as fair average illustrations of the races—would form a very good antidote to the tendency of the book in which it appears; and it is certainly worthy of men who, like one of the contributors to the volume, can say in one breath that men appear to be of distinct species, and in the next that this question loses its importance "in the presence of a still higher one—the original diversity of all organic forms."*

* I cannot conceal my belief that the appearance of such works as the "Types of Mankind" and "Indigenous Races of the Earth," which, under pretence of scientific investigation, deal so much in unverified statements as to facts, garbled quotations, and confused and illogical controversy, boldly asserting as facts or acknowledged principles the most doubtful propositions, and regarding with skepticism the best established results

3. The races of men differ in those points in which the higher animals usually vary with the greatest facility. The physical characters chiefly relied on have been colour, character of hair and form of skull, together with diversities in stature and general proportion. These are precisely the points in which our domestic races are most prone to vary. The manner in which these characters differ in the races of men may be aptly illustrated by a few examples of the arrangements to which they lead.

Dr. Pickering, of the U. S. Exploring Expedition,*—who does not, however, commit himself to any specific distinctions,—has arranged the various races of men on the very simple and obvious ground of colour. He obtains in this way four races—the White, the Brown, the Blackish-brown, the Black. The distinction is easy; but it divides races historically, philologically, and structurally alike; and unites those which, on other grounds, would be separated. The white race includes the Hamite Abyssinian, the Semitic Arabian, the Japetic Greek. The Ethiopian or Berber is separated from the cognate Abyssinian, and the dark Hindoo from the paler races speaking like him tongues allied to the Sanscrit. The Papuan, on the other hand, takes his place with the Hindoo; while the allied

of previous investigations,—are most discreditable to American science. It is even more lamentable that men like Agassiz and Leidy should allow themselves to be identified with such works.

* The Races of Men, &c. Boston, 1848.

Australian must be content to rank with the Negro; and the Hottentot is promoted to a place beside the Malay. It is unnecessary to pursue any farther the arrangement of this painstaking and conscientious inquirer. It conclusively demonstrates that the colour of the varieties of the human race must be arbitrary and accidental, and altogether independent of unity or diversity of origin.

Much use has been made, by the advocates of diversity of species, of the quality of the hair in the different races. That of the Negro is said to be flat in its cross section—in this respect approaching to wool. That of the European is oval; and that of the Mongolian and American round.* The subject has as yet been very imperfectly investigated; but its indications point to no greater variety than that which occurs in many domesticated animals—as, for instance, the hog and sheep. Nay, Dr. Carpenter states,†—and the writer has satisfied himself of the fact by his own observation,—that it does not exceed the differences in the hair from different parts of the body of the same individual. The human hair, like that of mammals in general, consists of three tissues: an outer cortical layer, marked by transverse striae, having in man the aspect of delicate lines, but in many other animals assuming the character of distinct joints or prominent serrations; a layer of elongated, fibrous cells, to which the hair owes most of its tenacity; and an inner cylinder of rounded

* Browne, of Philadelphia, quoted by Kneeland and others.

† Todd's Cyclopedia, Art. Varieties of Man.

cells. In the proportionate development of these several parts, in the quantity of colouring matter present, and in the transverse section, the human hair differs very considerably in different parts of the body. It also differs very markedly in individuals of different complexions. Similar but not greater differences obtain in the hair of the scalp in different races; but the flatness of the Negro's hair connects itself inseparably with the oval of the hair of the ordinary European, and this with the round observed in some other races. It generally holds that curled and frizzled hair is flatter than that which is lank and straight; but this is not constant, for I have found that the waved or frizzled hair of the New Hebrideans, intermediate apparently between the Polynesians and Papuans, is nearly circular in outline, and differs from European hair mainly in the greater development of the fibrous structure and the intensity of the colour. Large series of comparisons are required; but those already made point to variation rather than specific difference. Some facts also appear to indicate very marked differences as occurring in the same race from constant exposure or habitual covering; and also the occasional appearance of the most abnormal forms, without apparent cause, in individuals. The differences depending on greater or less abundance or vigour of growth of the hair, are obviously altogether trivial, when compared with such examples as the hairless dogs of Chili, and hairless cattle of Brazil; or even with the differences in this respect observed in individuals of the same race of men.

Confessedly the most important differences of the races of men are those of the skeleton, in all parts of which variations of proportion occur, and are of course more or less communicated to the muscular investments. Of these, as they exist in the pelvis, limbs, &c., I need say nothing; for, manifest though they are, they all fall far within the limits of variation in familiar domestic animals, and also of hereditary malformation or defect of development occurring in the European nations, and only requiring isolation for its perpetuation as a race. The differences in the skull merit more attention, for it is in this and in its enclosed brain that man most markedly differs from the lower animals, as well as race from race. It is in the form rather than in the mere dimensions of the skull that we should look for specific differences; and here, adopting the vertical method of Blumenbach, as the most characteristic and valuable, we find a greater or less antero-posterior diameter—a greater or less development of the jaws and bones of the face. The skull of the normal European, or Caucasian of Cuvier, is round oval; and the jaws and cheek-bones project little beyond its anterior margin, when viewed from above. The skull of the Mongolian of Cuvier is nearly round, and the cheek-bones and jaws project much more strongly in front and at the sides. The Negro skull is lengthened from back to front; the jaws project strongly, or are prognathous; but the cheek-bones are little prominent. For the extremes of these varieties, Retzius has proposed the very suitable names of brachy-kephalic or

short-headed, and dolicho-kephalic or long-headed. The differences indicated by these terms are of great interest, as distinctive marks of many of the unmixed races of men; but, when pushed to extremes, lead to very incorrect generalisations—as Prof. D. Wilson has well shown in his paper on the supposed uniformity of type in the American races—a doctrine which he fully refutes, by showing that within a very narrow geographical range, this primitive and unmixed race presents very great differences of cranial form.* Exclusive of idiots, artificially compressed heads, and deformities, the differences between the brachy-kephalic and dolicho-kephalic heads, range from equality in the parietal and longitudinal diameter to the proportions of about 14 to 24. As stated by some ethnologists, these differences appear quite characteristic and distinct; but, so soon as we attempt any minute discrimination, all confidence in them as specific characters disappears. In our ordinary European races similar differences, and nearly as extensive, occur. The dolicho-kephalic head is really only an immature form perpetuated; and appears not only in the Negro but in the Eskimo, and in certain ancient and modern Celtic races. The brachy-kephalic head, in like manner, is characteristic of certain tribes and portions of tribes of Americans, but not of all; of many northern Asiatic nations; of certain Celtic and Scandinavian tribes; and often appears in the modern European races as an occasional character. Farther, as Retzius has well shown, the long

* Canadian Journal, 1857.

heads and prominent jaws are not always associated with each other; and his classification, as quoted by Dr. Meigs,* is really the testimony of an able observer against the value of these characters. He shows that the Celtic and Germanic races (in part) have long heads and straight jaws; while the Negroes, Australians, Oceanians, Caribs, Greenlanders, &c., have long heads and prominent jaws. The Laplanders, Fins, Turks, Sclaves, Persians, &c., have short heads and straight jaws; while the Tartars, Mongolians, Incas, Malays, Papuans, &c., have short heads and prominent jaws.

Another defect in the argument often based on the diverse forms of heads, is its want of acknowledgment of the ascertained and popularly known fact, that these forms in different tribes or individuals of the same race, are markedly influenced by culture and habits of life. In all races ignorance and debasement tend to induce a prognathous form, while culture tends to the elevation of the nasal bones, to an orthognathous condition of the jaws, and to an elevation and expansion of the cranium. Any observer may satisfy himself of this by examination of the facial forms in the natives of those ruder districts in Great Britain and Ireland,† where the type has not been modified by culture,

* Indigenous Races, p. 253.

† See Carpenter in Todd's Cyclopedia. These facts are remarkably manifest in the lower class of immigrants to America, whether from Britain, Ireland, or the continent of Europe. It is a question how far poor food and exposure, as well as the causes before mentioned, may tend to give a degraded form of skull.

and where he will often find forms as coarse as those of the Negro or Mongol.

Again, no adequate allowance has been made in the case of these forms of skull, for the influence of modes of nurture in infancy. Dr. Morton, observing that the brachy-kephalic American skull was often unequal sided, and the occiput much flattened, suggests that this is "an exaggeration of the natural form produced by the pressure of the cradle-board in common use among the American natives." Dr. Wilson has noticed the same unsymmetrical character in brachy-kephalic skulls in British barrows, and has suspected some artificial agency in infancy; and says, in reference to the American instances,—"I think it extremely probable that further investigation will tend to the conclusion that the vertical or flattened occiput, instead of being a typical characteristic, pertains entirely to the class of artificial modifications of the natural cranium familiar to the American ethnologist." To what extent may such forms become hereditary, and to what extent may the long heads of Negroes be due to the habit in some African nations of slinging the child sidelong on the back of the mother, instead of strapping it to a board as is the custom of the American Indians? These are questions pertaining to the nursery, and it might be well to have the verdict of a jury of matrons on them, before building new ethnological doctrines on the comparison of crania.

While the points in which the races of men vary are those in which lower animals are most liable to undergo

change, the several races display a remarkable constancy in those which are usually less variable. Pritchard and Carpenter have well shown this in relation to physiological points, as for instance the age of arriving at maturity, the average and extreme duration of life, and the several periods connected with reproduction. The coincidence in these points alone is by many eminent physiologists justly regarded as sufficient evidence of the unity of the species.

4. It may also be affirmed in relation to the varieties of man, that they do not exceed in amount or extent those observed in the lower animals. If with Frederick Cuvier, Dr. Carpenter, and many other naturalists, we regard the dog as a single species, descended in all probability from the wolf, we can have no hesitation in concluding that this animal far exceeds man in variability.* But this is denied by many, not without some show of reason; and we may, therefore, select some animal respecting which little doubt can be entertained. Perhaps the best example is the hog, an undoubted descendant of the wild boar, and a creature especially suitable for comparison with man, inasmuch as its possible range of food is very much the same with his, which is not the case with any other of our domesticated animals; and as its head-quarters as a species are in the same regions which have supported the greatest and oldest known communities of men. We, of course, exclude from our comparison the native hogs of the Cape de Verd Islands,

* For an interesting inquiry into the origin of the dog, see the article in Todd's Cyclopedia already referred to.

of the south of Africa, and of Papua, which have been regarded as distinct species; and we need not insist on the Chinese hog, though this can scarcely claim specific distinctness. The colour of the domestic hog varies, like that of man, from white to black; and in the black hog the skin as well as the hair partakes of the dark colour. The abundance and quality of the hair vary extremely; the stature and form are equally variable, much more so than in man. Blumenbach long ago remarked that the difference between the skull of the ordinary domestic hog and that of the wild boar, is quite equal to that observed between the Negro and European skulls. The breeds of swine even differ in directions altogether unparalleled in man. For instance, both in America and Europe, solid hoofed swine have originated and become a permanent variety; and there is said to be another variety with five toes.* These are the more remarkable, because, in the American instances, there can be no doubt that the common hog has assumed these abnormal forms.

5. All varieties or races of men intermix freely, in a manner which strongly indicates specific unity. We hold here, as already stated, that no good case of a permanent race arising from intermixture of distinct species of the lower animals has been adduced; but there is another fact in relation to this subject which the advocates of specific diversity would do well to study. Even in varieties of those domestic animals which are certainly specifically identical,

* Pritchard, Bachman, Cabell.

as the hog, the sheep, the ox—although crosses between the varieties may be easily produced—they are not readily maintained, and sometimes tend to die out. What are called good crosses lead to improved energy, and continual breeding in and in of the same variety leads to degeneracy and decay: but, on the other hand, crosses of certain varieties are proved by experience to be of weakly and unproductive quality; and every practical book on cattle contains remarks on the difficulty of keeping up crosses, without intermixture with one of the pure breeds. It would thus appear that very unlike varieties of the same species display in this respect, in an imperfect manner, the peculiarities of distinct species. It is on this principle that I would in part account for some of the exceptional facts which occur in mixed races of men.

What, then, are the facts in the case of man? In producing crosses of distinct species, as in the case of the horse and ass, breeders are obliged to resort to expedients to overcome the natural repugnance to such intermixture. In the case of even the most extreme varieties of man, if such repugnance exists, it is voluntarily overcome, as the slave population of America testifies abundantly. By far the greater part of the intermixtures of races of men tend to increase of vital energy and vigour, as in the case of judicious crosses of some domestic animals. Where a different result occurs, we usually find sufficient secondary causes to account for it. I shall refer to but one such case —that of the half-breed American Indian. In so far as I

have had opportunities of observation or inquiry, these people are prolific; much more so than the unmixed Indian. They are also energetic, and often highly intellectual; but they are of delicate constitution, especially liable to scrofulous diseases, and therefore not long lived. Now, this is precisely the result which often occurs in domestic animals, where a highly cultivated race is bred with one that is of ruder character and training; and it very probably results from the circumstance that the progeny may inherit too much of the delicacy of the one parent to endure the hardships congenial to the other; or, on the other hand, too much of the wild nature of the ruder parent to subsist under the more delicate nurture of the more cultivated. This difficulty does not apply to the intermixture of the Negro and the European, though between the pure races this is a cross too abrupt to be likely to be in the first instance successful. In the mean time this department of the subject may be safely left to Dr. Nott, who, in his essay on hybridity in the 'Types of Mankind,' states as the result of a long series of observations in the Southern States, several propositions in reference to mulattos, in the main remarkably accordant with the observed facts in cross breeds of inferior animals of like species. It is true that he maintains, contrary to his own general doctrine that hybrids of closely allied species are permanently prolific,—that the mulattoes are too unproductive and delicate to be preserved from extinction except by intermixture with the pure races; but to reconcile this with undeniable facts, he

is obliged to bring a wholesale accusation of want of chastity against the mulatto women—an assertion as monstrous and improbable as it is the reverse of flattering to the morality of his compatriots.

6. The races of man may have originated in the same manner with the breeds of our domesticated animals. There are many facts which render it probable that they did originate in this way. Take colour, for instance. The fair varieties of man occur only in the northern temperate zone, and chiefly in the equable climates of that zone. In extreme climates, even when cold, dusky and yellow colours appear. The black and blackish-brown colours are confined to the intertropical regions, and appear in such portions of all the great races of mankind as have been long there domiciled. Diet and degree of exposure have also evidently very much to do with form, stature, and colour. The deer-eating Chippewayan of certain districts of North America, is a better developed man than his compatriots who subsist principally on rabbits and such meaner fare; and excess of carbonaceous food, and deficiency of perspiration or of combustion in the lungs, appear everywhere to darken the skin.* The Negro type in its extreme form is peculiar to low and humid river valleys of

* A curious note, by Dr. John Rae, on the change of complexion in the Sandwich Islanders, consequent on the introduction of clothing, may be found in the "Montreal Medical Chronicle," 1856, and the "Canadian Journal" for the same year.

tropical Africa.* In Australasia similar characters appear in men of a very different race in similar circumstances. The Mongolian type reappears in South Africa. The Esquimaux is like the Fuegian. The American Indian, both of South and North America, resembles the Mongol; but in several of the middle regions of the American continent men appear who approximate to the Malay. Everywhere, and in all races, coarse features and deviations from the oval form of skull are observed in rude populations. Where men have sunk into a child-like simplicity, the elongated forms prevail. Where they have become carnivorous, aggressive, and actively barbarous, the brachykephalic forms abound. These and many other considerations tend to the conclusion that these varieties are inseparably connected with external conditions. It may still be asked—Were not the races created as they are, with especial reference to these conditions? I answer no

* Latham, in his late work, "Descriptive Ethnology," illustrates this fact very fully, showing that the Tula tribes occupy the dry plateaus, and the Negroes the worst valleys. He farther adds,—"Mark on a map the areas on which these several varieties are spread, compare it with the geological chart of Russegger, and the closeness of the coincidences will perhaps surprise you. The blacks are found on the Tertiary and recent deposits. The primitive and volcanic tracts will give the European faces. The intermediate conformations will be found on the sandstone. Read Livingstone. The same results will present themselves, and the author himself will draw attention to them. The Negro is an exceptional African."

—because the differences are of a character in every respect like those that appear in other true species as the results of influences from without.

Farther, not only have we varieties of man resulting from the slow operation of climatal and other conditions, but we have the sudden development of races. One remarkable instance may illustrate my meaning. It is the hairy family of Siam, described by Mr. Crawford and Mr. Yule.* The peculiarities here consisted of a fine silky coat of hair covering the face and less thickly the whole body, with at the same time the entire absence of the canine and molar teeth. The person in whom these characters originated was sent to Ava as a curiosity when five years old. He married at twenty-two, his wife being an ordinary Burmese woman. One of two children who survived infancy, had all the characters of the father. This was a girl; and on her marriage, the same characters re-appeared in one of two boys constituting her family when seen by Mr. Yule. Here was a variety of a most extreme character, originating without apparent cause, and capable of propagation for three generations, even when crossed with the ordinary type. Had it originated in circumstances favourable to the preservation of its purity, it might have produced a tribe or nation of hairy men, with no teeth except incisors. Such a tribe would, with some ethnologists, have constituted a new and very distinct species; and any one who had suggested the possibility of its

* Latham's Descriptive Ethnology.

having originated within a few generations as a variety, would have been laughed at for his credulity. It is unnecessary to cite any farther instances. I merely wish to insist on the necessity of a rigid comparison of the variations which appear in man, either suddenly or in a slow or secular manner, with the characters of the so-called races or species.

I have been obliged, by the limits to which this subject must here be necessarily confined, to restrict myself to a very short review of the points in which the races of men resemble varieties rather than species. Every reader, however, has some knowledge of the facts as to the variations observable in the same and different races, and the phenomena connected with them, and may thus make the comparison for himself. Further information may be found in Pritchard, in Bachman, and in a very useful summary of the argument by Prof. Cabell in his review of the Types of Mankind and Indigenous Races of the Earth.* We must now proceed to the third department of our inquiry; Are the individuals of one species necessarily of one origin, and does the unity of the human species thus prove its unity of origin?

III. A few years ago it would hardly have been considered necessary to ask such a question: naturalists were generally disposed to agree with the great Cuvier, that "We are under the necessity of admitting the existence of

* Published separately under the title, "Unity of Mankind."

certain forms which have perpetuated themselves from the beginning of the world without exceeding the limits first prescribed; all the individuals belonging to one of these forms constitute what is termed a species." The necessity of the case is indeed apparent at first sight. We observe in any species continuous unchanged reproduction and increase. Traced forward, if no obstacles intervened, this would give us indefinite multiplication. Traced backward, it would lead to the smallest possible number of individuals; that is, to origin in a single individual, or single pair. If any one asks us to admit more, he asks us to admit more than a sufficient cause for the observed phenomena, and must, therefore, be put on the proof of the necessity of such additional causes. Farther, he may be required to prove the plurality of origin in the case of every species in question.

The only modern naturalist of eminence who seems disposed to attempt this proof of the diversity of origin of species, is Prof. Agassiz, whose principal argument is the geographical distribution of animals. The world may, in reference to its animal inhabitants, be divided into several zoological districts, more or less distinctly limited, and more or less large, in each of which there is a special group of species created for and probably in that region; but there always are a few species, sometimes many, that are common to two or more regions. These species naturalists have usually supposed to have extended themselves from

one region into another; and the late Prof. E. Forbes* has brought together a remarkable and curious series of facts to show that this must have been actually the case with the plants and animals of the West of Europe.† Prof. Agassiz prefers to believe that these species, common to two centres of creation, have originated separately in each. It is quite plain that no one can be fairly called on to believe this, unless, after making all allowance for possible modes of transference and for changes of surface that may have occurred, there shall remain no possibility of the transmission of the species in question from one of its supposed or known centres of creation to the other. Agassiz, however, overlooking the necessity which continuous reproduction lays upon us to demand such proof, really begs the question in so far as distribution is concerned, and substituting for evidence a definition of species altogether excluding the idea of common origin, thus tries to shift the burden of proof on his opponents. Let us examine his definition as stated in the Contributions to the Natural History of America. Its shorter form has already been given, but a more full explanation is afforded by the following passage, which I quote, along with some objections which I have urged against it elsewhere‡:—

* Memoirs of Geological Survey of Great Britain.

† Prof. Gray has also on similar principles very ably accounted for the remarkable resemblance of the floras of Eastern Asia and Eastern America.—(Silliman's Journal, Aug. 1859.)

‡ Canadian Naturalist and Geologist, Aug. 1858.

"The species is an ideal entity, as much as the genus, the family, the order, the class, or the type; it continues to exist, while its representatives die, generation after generation. But these representatives do not simply represent what is specific in the individual, they exhibit and reproduce in the same manner, generation after generation, all that is generic in them, all that characterises the family, the order, the class, the branch, with the same fullness, the same constancy, the same precision. Species, then, exist in nature in the same manner as any other groups; they are quite as ideal in their mode of existence as genera, families, &c., or quite as real. But individuals truly exist in a different way: no one of them exhibits at one time all the characteristics of the species, even though it be hermaphrodite; neither do any two represent it, even though the species be not polymorphous; for individuals have a growth, a youth, a mature age, an old age, and are bound to some limited home during their lifetime. It is true, species are also limited in their existence; but for our purpose, we can consider these limits as boundless, inasmuch as we have no means of fixing their duration, either for the past geological ages, or for the present period, whilst the short cycles of the life of individuals are easily measurable quantities. Now, as truly as individuals, while they exist, represent their species for the time being, and do not constitute them, so truly do these same individuals represent at the same time their genus, their family, their order, their class, and their type, the characters of which they bear as indelibly as those of the species."

In this general statement, with the explanations elsewhere given of it, in relation to the supposed capacity of species for intermixture, and original creation of numbers of representatives of the same species in different places, we see much that is objectionable, and a want of that accuracy of thought which is essential in treating of such a subject. The author, indeed, reverses the processes of sound reasoning—first framing a definition which excludes some of the usual characters of species, and then deducing from it certain conclusions as to their origin. The definition itself will not endure criticism.

First, we cannot admit the high standing here given to the individual animal. The individual is confounded with an entirely different thing, namely, the *unit* of the science. As has been well stated above, the individual rarely represents the species as a whole. To give this we have to employ a series of individuals, including the differences of age and sex, and the limits of variation under external circumstances. The individuals representing these varieties are, therefore, only fractional parts of a unit, which is the species. Let it be observed, also, that the relation here is different from that which subsists between the species and the genus. Each species should have all the generic characters with those that are specific; but each individual, as a fraction of the species, need not necessarily possess all the mature characters of the species; and this is one reason of the indistinct notion in many minds that the limits of species are more uncertain than those of

genera. On the other hand, the idea of specific unity is expressed by our attaching the specific name to any individual that we may happen to have; and even popular speech expresses it when it says the grizzly bear, the Arctic fox.

Secondly, the species is not merely an ideal unit: it is a unit in the work of creation. No one better indicates than Agassiz the doctrine of the creation of animals; but to what is it that creation refers?—not to genera and higher groups, they express only the relations of things created,—not to individuals as now existing, they are the results of the laws of invariability and increase of the species,—but to certain original individuals, protoplasts, formed after their kinds or species, and representing the powers and limits of variation inherent in the species—the potentialities of their existence, as Dana well expresses it. The species, therefore, with all its powers and capacities for reproduction, is that which the Creator has made, his unit in the work, as well as ours in the study. The individuals are merely so many masses of organised matter, in which, for the time, the powers of the species are embodied; and the only animal having a true individuality is man, who enjoys this by virtue of mental endowments, over-ruling the instincts which in other animals narrowly limit the action of the individual. To this great difference between the limitations imposed on animals by a narrow range of specific powers, and the capacity for individual action which in man forces even his physical organisation,

in itself more plastic than that of most other animals, to bend to his dominant will, we trace not only the varieties of the human species, but the changes which man effects upon those lower animals which in instincts and constitution are sufficiently ductile for domestication.

Thirdly, the species is different, not in degree, but in kind, from the genus, the order, and the class. We may recognise a generic resemblance in a series of line engravings representing different subjects, but we recognise a specific unity only in those struck from the same plate; and no one can convince us that the resemblance of a series of coins, medals, or prints, from different dies or plates, is at all of the same kind with that which subsists between those produced from the same die or plate. In like manner, the relation between the members of the brood of the song-sparrow of this spring, is of a different kind as well as different degree from that between the song-sparrow and any other species of sparrow. So of the brood of last year to which the parent sparrows may have belonged; so by parity of reasoning of all former broods, and all song-sparrows everywhere. The species differs from all other groups in not being an ideal entity, but consisting of individuals struck from the same die, produced by continuous reproduction from the same creative source. Nor need we suppose with our author—for as yet it is merely an hypothesis—that species may have sprung from two or several origins. We cannot be required to assume a cause greater than that which the effect demands; and if one pair of the American

Crow or Canada Goose would now be sufficient, in a calculable number of years, to supply all America with these species, we need not suppose any more. Even in those cases where one centre of creation appears to be insufficient, this may only be a defect in our information, as to the precise range of the species, its capabilities for accommodating itself to external differences of habitat, and the geological changes which may have occurred since its creation. Take the example given at page 40 of the "Contributions." The American Widgeon and British Widgeon, and the American and British red-headed Ducks, are distinct species. The Mallard and Scaup Duck are common to both sides of the Atlantic. The inference is that since the distinct species of Widgeons and Red Ducks were probably created on the opposite sides of the Atlantic, so were the Mallards, though specifically identical. To prove this is obviously altogether impossible; but even to establish some degree of probability in its favor, it would be necessary to show that the Widgeons and Red Ducks equal the Mallard and Scaup Duck in hardiness, in adaptability to different conditions of climate and food, in migratory instinct and physical powers of migration; and farther, that these species are equally old in geological time. We do not happen to know, in reference to this last particular, which species is the oldest, if there is any difference; but remains of ducks have been found in the later deposits, and if it should prove that the species now more widely distributed existed at a time when the distribution of land

and water was different from that which now prevails, we should have a case quite parallel to many known to geologists, and utterly subversive of the view before us. The Mallard is also an unfortunate instance, from its well-known adaptation for domesticity, and consequently proved capability of sustaining very different conditions of existence. The Scaup Duck, hardy and carnivorous, a sea-duck and a good diver, and Asiatic as well as European, is probably far better fitted for extensive migration than the Widgeon. It is on such grounds, incapable of positive proof, and with palpable flaws in even the negative evidence, that we are required to multiply the miracle of creation, rather than to submit patiently to investigate the psychical, physiological, and physical agencies involved in one of the most interesting problems of zoology, the geographical distribution of animals.

One farther remark is rendered necessary by the illustration above referred to. No one knows better than Agassiz that to compare, in reference to their geographical distribution, animals nearly related, may often lead to errors greater than those likely to result from the comparison of creatures widely different in structure but adapted for somewhat similar external conditions of existence. It is a fact very curious in itself, independently of this application, that we find closely related species differing remarkably in this respect; and that, on the other hand, animals of very different grades and structures are equally remarkable for wide geographical ranges. The causes of these

differences are often easily found in structural, physiological, or psychical peculiarities; but in many cases they depend on minute differences not easily appreciable, or on the effects of geological changes.

Fourthly.—Our author commences his dissertation on species by taunting those who maintain the natural limits set to hybridity with a petitio principii. The accusation might be turned against himself. The facts shewing that species in their natural state do not intermix, and that hybrids are only in exceptional cases fertile, so enormously preponderate over the few cases of fertile hybridity, that the latter may be regarded as the sort of exception which proves the rule. The practical value of this character in ascertaining the distinctions of species in difficult cases is quite another question, as is the precise nature of the resemblances in distinct species which most favour hybridity, and the greater or less fixity of the barrier in the case of species inhabiting widely separated geographical areas, when these are artificially brought together. Nor is the specific unity to be broken down by arguments derived from the difficulty of discriminating or of identifying species. The limits of variability differ for every species, and must be ascertained by patient investigation of large numbers of specimens, before we can confidently assert the boundaries in some widely distributed and variable species; but in the greater number this is not difficult, and in all may be ascertained by patient inquiry.

Fifthly.—The above considerations, in connection with

the doctrines of created protoplasts, and the immutability of species, as so ably argued by Agassiz himself, we hold irresistibly compel us to the conclusion of Cuvier, that a species consists of the "beings descended the one from the other or from common parents." This being admitted, it must be only on the most cogent grounds, to be established in every individual case, that we can admit a difference of origin either in geological time or in space, for animals that on comparison appear to be specifically identical; and we cannot allow ourselves to be required to prove the unity of origin of species in general, any farther than in cases where there appears to be actual evidence of diverse origin. Such evidence must be required not only by those who hold the unity of origin of man, but also by the physical geographer and geologist. If the same species has in many or ordinary cases been created several times over in different regions or in different geological times, the occurrence of such species can be no certain evidence either of locality or of geological date. Farther, although in the varieties of a species all derived from one origin, we can have some guarantee for the limitation of these varieties by a certain law, this can scarcely hold if we allow the individuals assigned to one species to have been, with the variations incidental to them, the product of different local creations. In this case, we reduce species to mere types, graduating insensibly into each other. In short, for practical purposes, there may as well be no species at all, since we then have no fixed limits on which to base our larger

aggregates; and, on the principle that extremes meet, this doctrine leads to precisely the same practical results with the Lamarckian hypothesis of transmutation.

Farther, it is manifestly not true that species are limited in any precise manner to geographical districts. Nay more, we have evidence in modern times of species having extended their limits over several regions. The black rat (*Mus rattus*) has done so long since. The brown rat (*Mus decumanus*) has done so in still more modern times, and not only over-rides all regions, but domiciles itself against their will with all races of men. The horse, the ox, and the hog, only required to be brought to America, to show that they needed no second local creation to allow them to flourish in a new region. Man brought them, it is true; but he had to extend himself first. The modern extension of the European race of men is itself a case in point. The Teutonic and Celtic man seems to live and thrive, albeit with some small tendency to vary, in the fauna of temperate America, of South Africa and of Australia, as well as in nearly every other "region" of the earth. Nor is this peculiar to civilised man. The Malay race, against the enormous physical obstacle of a wide ocean area, has extended itself from Madagascar to Easter Island and the coast of California, and from the Sandwich Islands in the north to New Zealand in the south, independently of its affinities with tribes on the mainland of Asia; "thus reaching, chiefly within the tropics, over 200 degrees of longitude, or 20 degrees more than half the

circumference of the globe, and spreading in a direction north and south over 70 degrees." * This extension is proved, not merely by physical characters, but by language, a far more certain criterion. Nor is this race, so widely distributed, altogether isolated. It is connected, through the continental Malays, with the populations of Southern and Eastern Asia; and even in Madagascar, its language retains some Sanscrit words.†

The Eskimo of Arctic America is identical, in structure and language, with his neighbours on the Asiatic side of Behring's Straits; and these graduate insensibly into a long chain of northern tribes, ending in the Fins and Laps, and sending off many links of connection to all the Mongolian nations. Nay, even the Caucasians, long regarded as the type of the European races, appear, according to Latham, to be connected by language with this stock. On the other hand, although in Eastern America the Eskimo come abruptly into contact with tribes somewhat unlike themselves, on the west coast they graduate insensibly into the Indian; and Wilson has shown that their conformation of skull is much less unlike that of the normal Indian than Dr. Morton had supposed. The American runs across all regions, with little change of feature, colour, or skull, except when the latter has been artificially compressed; and it has recently been ascer-

* Ellis, "Madagascar," Appendix. See also Lyell's Principles of Geology.

† W Humboldt.

tained that the characters of the Eskimo and Samoyede re-appear in Patagonia,* just as somewhat similar Mongol characters re-appear in the Hottentot of South Africa; a singular proof that climate, food, and other external conditions, rather than race, must be regarded as the cause of variation in these instances. Such facts show that whatever difficulties may attend the explanation of the wide geographical distribution of some animals, there are none in the case of man. The attempt, then, sanctioned by so great a name as that of Agassiz, to establish diversity of origin for the individuals of the same species on the ground of geographical distribution, falls to the ground; and perhaps fails most signally of all in the case of man. We may, therefore, safely rest on that philosophical necessity for the unity of origin of each species with which we commenced this part of the inquiry; at least until it shall be shown that the individuals of some one true species must be diverse in origin.

I have now presented a brief summary of the zoological facts and principles bearing on this question; and have, I trust, shown that what we know of species and their distribution should at least induce us to regard as probable the specific unity and common origin of all nations of men. We may now turn to these questions as they present themselves in the light of philology and history.

IV. In many animals the voice is useful as a distinctive character; but in man it has an importance altogether

* Latham, "Varieties of Man."

peculiar. The gift of speech is one of his sole prerogatives, and identity in its mode of exercise is not only the strongest proof of similarity of psychical constitution, but, more than any other character, marks identity of origin. The tongues of men are many and various; and at first sight this diversity may, as indeed it often does, convey the impression of radical diversity of race. But modern philological investigations have shown many and unexpected links of connection in vocabulary, or grammatical structure, or both, between languages apparently the most dissimilar. I do not here refer to the vague and fanciful parallels with which our ancestors were often amused, but to the results of sober and scientific inquiry. Let us examine for a little these results as they are presented to us by Latham, Muller, Bunsen, and other modern philologists.

A convenient starting-point is afforded by the great group of languages known as the Indo-European or Japetic. From the Ganges to the west coast of Ireland, through Indian, Persian, Greek, Italian, German, Celt, runs one great language—the Sanscrit and the dark Hindoo at one extreme, the Erse and the xanthous Celt at the other. No one now doubts the affinity of this great belt of languages. No one can pretend that any one of these nations learned its language from another. They are all decided branches of a common stock. Lying in and near this area, are other nations, as the Arabs, the Syrians, the Jews, speaking languages differing in words and structure—the

Semitic tongues. Do these mark a different origin? The philologists answer in the negative, pointing to the features of resemblance which still remain, and above all to certain intermediate tongues of so high antiquity that they are rather to be regarded as root stocks from which other languages diverged than as mixtures. The principal of these is the ancient Egyptian, represented by the inscriptions on the monuments of that wonderful people, and by the more modern Coptic, which, according to Bunsen and Latham, presents decided affinities to both the great classes previously mentioned, and may be regarded as strictly intermediate in its character. It has accordingly been designated by the term Sub-Semitic.* But it shares this character with all or nearly all the other African languages, which bear strong marks of affinity to the Egyptian and Semitic tongues. On this subject Dr. Latham says, "That the uniformity of languages throughout Africa is greater than it is either in Asia or in Europe, is a statement to which I have not the least hesitation in committing myself."† To the north the Indo-European area is bounded by a great group of semi-barbarous populations,

* Donaldson has pointed out (Brit. Association Proceedings, 1851) links of connection between the Slavonian or Sarmatian tongues and the Semitic languages, which, in like manner, indicate the primitive union of the two great branches of languages. (See also Appendix I.)

† Man and his Migrations. See also "Descriptive Ethnology," where the Semitic affinities are very strongly brought out.

mostly with Mongolian features, and speaking languages which have been grouped as Turanian. These Turanian languages, on the one hand, graduate without perceptible break into the Eskimo and American Indian; on the other, according to Muller and Latham, they are united, though less distinctly, with the Semitic and Japetic tongues. Another great area on the coasts and in the islands of the Pacific is overspread by the Malay, which, through the populations of trans-gangetic India, connects itself with the great Indo-European line. If we regard physical characters, manners and customs, and mythologies, as well as mere language, it is much easier thus to link together nearly all the populations of the globe. In investigations of this kind, it is true, the links of connection are often delicate and evanescent; yet they have conveyed to the ablest investigators the strong impression that the phenomena are rather those of division of a radical language than of union of several radically distinct.

This impression is farther strengthened when we regard several results incidental to these researches. Latham has shown that the languages of men may be regarded as arranged in lines of divergence, the extreme points of which are Fuego, Tasmania, Easter Island; and that from all these points they converge to a common centre in Western Asia, where we find a cluster of the most ancient and perfect languages. Farther, the languages of the various populations differ in proceeding from these centres in a manner pointing to degeneracy such as is likely to occur

in small and rude tribes separating from a parent stock. These lines of radiation follow the most easy and probable lines of migration of the human race spreading from one centre. It must also be observed that in the primary migration of men, there must of necessity have been at its extreme limits outlying and isolated tribes, placed in circumstances in which language would very rapidly change; especially as these tribes, migrating or driven forward, would be continually arriving at new regions presenting new circumstances and objects. When at length the utmost limit in any direction was reached, the inroads of new races of population would press into close contact these various tribes with their different dialects. Where the distance was greatest before reaching this limit, we might expect, as in America, to find the greatest mutual variety and amount of difference from the original stock. After the primary migration had terminated, the displacements arising from secondary migrations and conquests, would necessarily complicate the matter by breaking up the original gradations of difference, and thereby rendering lines of migration difficult to trace.

Taking all these points into the account, along with the known tendencies of languages in all circumstances to vary, it is really wonderful that philology is still able to give so decided indications of unity.

There is, in the usual manner of speaking of these subjects, a source of misapprehension, which deserves special mention in this place. The scriptures derive all the na-

tions of the ancient world from three patriarchs, and the names of these have often been attached to particular races of men and their languages; but it should never be supposed that these classifications are likely to agree with the Bible affiliation. They may to a certain extent do so, but not necessarily or even probably. In the nature of the case, those portions of these families which remained near the original centre, and in a civilized state, would retain the original language and features comparatively unchanged. Those which wandered far, fell into barbarism, or became subjected to extreme climatic influences, would vary more all respects. Hence any general classification, whether on physical or philological characters, will be likely to unite, as in the Caucasian group of Cuvier, men of all the three primitive families, while it will separate the outlying and aberrant portions from their main stems of affiliation. Want of attention to this point has led to much misconception; and perhaps it would be well to abandon altogether terms founded on the names of the sons of Noah, except where historical affiliation is the point in question. It would be well if it were understood that when the terms Semitic, Japhetic,* and Hametic are used, direct reference is made to the Hebrew ethnology; and that, where other arrangements are adopted, other terms should be used. It

* I can scarcely except such terms as "Japetic," and "Japetidae," for Iapetus can hardly be anything else than a traditional name borrowed from Semitic ethnology, or handed down from the Japhetic progenitors of the Greeks.

is obviously unfair to apply the terms of Moses in a different way from that in which he uses them. A very prevalent error of this kind has been to apply the term Japhetic to a number of nations not of such origin according to the Bible; and another of more modern date is to extend the term Semitic to all the races descended from Ham, because of resemblance of language. It should be borne in mind that, assuming the truth of the scriptural affiliation, there should be a "central" group of races and languages where the whole of the three families meet, and "sporadic" * groups representing the changes of the outlying and barbarous tribes.

While, however, all the more eminent philologists adhere to the original unity of language, they are by no means agreed as to the antiquity of man; and some, as for instance Latham and Dr. Max Muller, are disposed to claim an antiquity for our species far beyond that usually admitted. In so far as this affects the Bible history, it is of less importance than the denial of the unity of the species, since the Bible does not precisely limit the antiquity of man, or of the deluge, which, on its view, is of the same import. The date of this event has been variously estimated, on Biblical grounds, at from 1650 B. C. (Usher) to 3155 B. C. (Josephus, and Hales); but the longest of these dates does not appear to satisfy the demands of philology. The reason of this demand is the supposed length of time required to effect the necessary changes. This is a subject on which

* See Art. "Philology" Ency. Brit., last edition.

definite data can scarcely be obtained. Languages change now, even when reduced to a comparatively stable form by writing. They change more rapidly when men migrate into new climates, and are placed in contact with new objects. The English, the Dutch, and the German, were perhaps all at the dawn of the mediaeval era Maeso-Gothic. At the same rate of change, allowing for greater barbarism and greater migrations, they may very well have been something not far from Egyptian or Sanscrit 2000 years before Christ. The truth is, that present rates of variation afford no criterion for the changes that must occur in the languages of small and isolated tribes lapsing into or rising from barbarism, possessing few words, and constantly requiring to name new objects; and until some ratio shall have been established between these conditions and those of modern languages, fixed by literature and by a comparatively stationary state of society, it is useless to make any demands for longer time on this ground.*

Had the human race everywhere preserved its history from its origin, we should then have had certain evidence as to its points and times of origination. Unfortunately, this has not been the case. Barbarous nations have no history. Most of the so-called ancient nations are compa-

* See Appendix I. Grammatical structure is no doubt more permanent than vocabulary, yet we find great changes in the latter, both in tracing cognate languages from one region to another, and from period to period. The Indo-Germanic languages in Europe furnish enough of familiar instances.

ratively modern, and even their history loses itself in myths. The only ancient nations that have given us in detail their own written history are the Hebrews, the Hindoos, and the Chinese. The last people, though professedly very ancient, trace their history from a period of barbarism; a view confirmed by their physical characters and the nature of their civilization; and on this account, if no other, their history cannot be considered as of any ethnological value. The early Hindoo history is palpably fabulous or distorted, and has been variously modified and changed in comparatively modern times. The Hebrew history, as it bears on this point, we shall notice in the sequel. There is one great and very ancient people—the Egyptian—evidently civilised from the beginning of all history, that have not succeeded in transmitting to us, except in garbled fragments, their history; but have left abundant monumental evidence of great events that transpired among them; and, except the Hebrews, these are the only people who can profess to give us any authentic ancient history carrying us back to the origin of man.

The Egyptian history has been gathered first from sketches by Greek travellers, and from fragments of the chronicles of Manetho, one of the later Egyptian priests, and secondly from the inscriptions deciphered on Egyptian monuments and papyri. It is still in a very fragmentary and uncertain state, but has been used with considerable effect to prove both the diversity of races of men and the pre-Noachic antiquity of the species. The Egyptian, in

features and physical conformation, tended to the European forms, just as the modern Fellahs and Berbers do; but he had a dark complexion, a somewhat elongated head and flattened lips, and certain negroid peculiarities in his limbs. His language combined many of the peculiarities of the Semitic, Arian, and African tongues, indicating thereby great antiquity or else great intermixture; but not, as some ethnographers demand, both—most probably the former—the Egyptians being really the oldest civilised people that we certainly know; and therefore, if languages have one origin, likely to be near its root-stock.

The actual history of Egypt begins from Menes, the first human king, a monarch, or rather tribal chief, who took up his abode in the flats and fens of Lower Egypt, certainly not very long after the deluge. His name has been translated "one who walks with Khem" or Ham; one, therefore, who was contemporary with this great patriarch and god of the Egyptians, which will place his time within a century or two of the flood. The date of Menes has been variously placed. In correction of the ordinary Hebrew chronology, we have the following attempts:—

Josephus places his reign.....	2350 B.C.
Dr. Hales' calculation,.....	2412
Manetho and the Monuments, as corrected by Syncellus and calculated by various archæologists, ...	2712 to 2782
Herodotus' astronomical reduction by Rennell,	2890
Estimate by Gliddon in "Ancient Egypt,"	2750
Bunsen, "Egypt's Place," &c., ...	4000

The truth may be somewhere near the mean of the shorter chronologies given in this list.* That of Bunsen is liable to very grave objections; more especially as he adds to it other views, altogether unsupported by historical evidence, which would carry back the deluge to 10,000 years B. C. It rests wholly on the chronology of Manetho, who lived 300 years B C ; and who, even if the Egyptians then possessed authentic documents extending 3700 years before his time, may have erred in his rendering of them; and is farther liable to grave suspicions of having merely grouped the names on the monuments of his country arbitrarily in Sothic cycles. Further, they rest on an interpretation of Manetho, which supposes his early dynasties to have been successive, while good reasons have been found to prove that many of them consist of contemporaneous petty sovereigns of parts of Egypt. The early parts of Manetho's lists are purely mythical, and it is impossible to fix the point where his authentic history commences. He copied from monuments which have no consecutive dates, the precise age of which could only be vaguely known even in his time, and which are different in their statements in different localities. It is only by making due allowance for these uncertainties, that any historical value can be attached to these earlier dynasties of Manetho. Yet Bunsen has lately built on an uncertain interpretation of

* Reginald S. Poole has adduced very ingenious arguments, monumental, astronomical, and mythological, for the date B.C. 2717.

this writer, as handed down in a very fragmentary and evidently garbled condition, and on the equally or more uncertain chronology of Eratosthenes, a system differing from all previous belief on the subject, from the Hebrew history, and from all former interpretations of the monuments and Manetho.* Discarding, therefore, in the mean

* It is curious that almost simultaneously with the appearance of Bunsen's scheme, a similar view was attempted to be maintained on geological grounds. In a series of borings in the delta of the Nile, undertaken by Mr. Horner, there was found a piece of pottery at a depth which appeared to indicate an antiquity of 13,371 years. But the basis of the calculation is the rate of deposit (3½ inches per century) calculated for the ground around the statue of Rameses II. at Memphis, dated at 1361, B.C.; and Mr. Sharpe has objected that no mud could have been deposited around that statue from its erection until the destruction of Memphis, perhaps 800 years B.C. Further, we have to take into account the natural or artificial changes of the river's bed, which in this very place is said to have been diverted from its course by Menes, and which near Cairo is now nearly a mile from its former site. The liability to error and fraud in boring operations is also very well known. It has further been suggested that the deep cracks which form in the soil of Egypt, and the sinking of wells in ancient times, are other probable causes of error; and it is stated that pieces of burnt brick, which was not in use in Egypt until the Roman times, have been found at even greater depths than the pottery referred to by Mr. Horner. This discovery, at first sight so startling, and vouched for by a geologist of unquestioned honour and ability, is thus open to

time, this obviously exaggerated date, we may roughly estimate the date of Menes as 2000 to 2500 years B. C.,* and proceed to state some of the facts relating to our present subject developed by Egyptologists.

One of the most striking of these is the proof that Egypt was a new country in the days of Menes and several generations of his successors. The monuments of this period show nothing of the complicated idolatry, ritual, and caste system of later times, and are deficient in evidence of the refinement and variety of art afterwards attained. They also show that these early monarchs were principally engaged in dyking and otherwise reclaiming the alluvial flats; an evidence precisely of the same character with that which every traveller sees in the more recently settled districts of Canada, where the forest is giving way to the exertions of the farmer. This primitive state of things is

the same doubts with the Guadaloupe skeletons, the human bones in ossiferous caverns, and that found in the mud of the Mississippi; all of which have, on examination, proved of no value as proofs of the geological antiquity of man. See also Appendix L.

* Perhaps the earliest certain date in Egyptian history is that of Thothmes III. of the eighteenth dynasty, ascertained by Birch on astronomical evidence, as about 1445 B. C.; and it seems nearly certain that before the 18th dynasty, of which this king was the 5th sovereign, there was no settled general government over all Egypt. See on this and other points relating to Bunsen's views, an able review in the London Quarterly, No. 2, 1859.

indelibly stamped on the written and monumental history of this period in Egypt. Farther, in this primitive period, known as the "old monarchy," very few domestic animals appear, and experiments seem to have been in progress to tame others, natives of the country, as the hyena, the antelope, the stork. Even the dog in the older dynasties is represented by one or at most two varieties, and the prevalent one is a wolfish-looking animal akin to the present wild or half-tamed dogs of the East.* The Egyptians, too, of the earlier dynasties are more homogeneous in their appearance than those of the later, after conquest and migration had introduced new races; and the earliest monumental notice referring to Negro tribes does not appear until the 12th dynasty, about half way between the epoch of Menes and the christian era, nor does any representation of the Negro features occur until, at the earliest, the 17th dynasty. This allows ample time, 1000 years at the least, for the development, under abnormal circumstances and isolation, of all the most strongly-marked varieties of man. For proof of these statements I may refer to the

* The Egyptians seem, like our modern cattle-breeders, to have taken pride in the initiation and preservation of varieties. Their sacred bull, Apis, was required to represent one of the varieties of the ox; and one can scarcely avoid believing that some of their deified ancestors must have earned their celebrity as tamers or breeders of animals. At a later period, the experiments of Jacob with Laban's flock, furnish a curious instance of attempts to induce variation.

works of any of the Egyptologists, and may merely add that these and many other remarkable facts in the early monumental history of Egypt, which are patent to any reader, have been strangely overlooked or misapplied by ethnologists. Osburn,* though on many points too ready to follow very slender and doubtful clues, deserves credit for the attention which he has given to these hints.

But, in noticing the historical information as to the unity and antiquity of man, we must turn to the Bible itself, which, independently of its religious claims, is surely an historical document quite as respectable as even the monumental records of Egypt. And what a contrast do we find here to the darkness of Egyptian history and the speculations of those who attempt to reason on it! The Bible has no mythical period. It treats of no ages of gods and demi-gods, claims no fabulous antiquity for its people, asserts no divine origin for its heroes. It has many marvels and wonders, but they are all wrought by the Omnipotent Creator. Its human history is stamped with the impress of truth and nature, and its chronology is that merely of a continuous succession of human beings, differing from our present experience only in the duration which it assigns to human life in those primitive periods when our species was young on the earth; a point on which we have no data as yet from other sources either to oppose or confirm its doctrine. Nor does the Bible ever personify

* Monuments of Egypt.

natural objects or processes, in that vague way which renders us doubtful whether in the ancient myths of the heathen we are reading of every-day phenomena in a fanciful dress, or of human history seen through a coloured and distorting medium.

The Bible gives us a definite epoch, that of the deluge, for all human origins; but though no family but that of Noah survived this terrible catastrophe, it would be a great error to suppose that nothing antediluvian appears in the subsequent history of man. Before the deluge there were arts and an old civilization, and after the deluge men carried with them these heirlooms of the old world to commence with them new nations. This has been tacitly ignored by many of the writers who underrate the value of the Hebrew history. It may be as well for this reason to place, in a series of propositions, the principal points in Genesis which relate to the question of the unity of man.

1. Adam and Isha, the woman, afterwards called Eve (Life-giver) in consequence of the promise of a Redeemer, commenced a life of husbandry on their expulsion from Eden; and during the lifetime of the primal pair, the sheep, at least, was domesticated. A few generations after, in the time of Lamech, cattle were domesticated; and the metals, copper and iron, were applied to use—the latter probably meteoric iron; and hence, it may be, the Hindoo and Hellenic myths of Twachtrei and Hephaestos in connection with the thunderbolt. In the time of Noah the distinction of clean and unclean beasts, and the taking of

seven pairs of certain beasts and birds into the ark, imply that several mammals and birds were domesticated.*

2. Before the flood, as already remarked, there was a division of man into two nationalities or races; and there was a citizen, an agricultural, a pastoral, and a nomadic population.†

3. After the deluge, the arts of the antediluvians and their citizen life were almost immediately revived in the plain of Shinar; but the plans of the Babel leaders, like those of many others since, who have attempted to force distinct tribes into one nationality, failed. The guilt attributed to them probably relates to the attempt to break up the patriarchal organisation, which, in these early times, was the outward form of true religion.

4. The human race was scattered over the earth in family groups or tribes, each headed by a leading patriarch, who gave it its name. First, the three sons of Noah formed three main stems, and from these diverged several family branches. The ethnological chart in the 10th chapter of Genesis, gives the principal branches; but these, of course, continued to sub-divide beyond the space and time referred to by the sacred writer. It is simply absurd to object, as some writers have done, to the universality of the statements in Genesis, that they do not mention in detail the whole earth. They refer to a few generations

* Genesis 4, 5, 6 and 7th chapters. See also our previous remarks on the deluge.

† Genesis 4.

only, and beyond this restrict themselves to the one branch of the human family to which the Bible principally relates. We should be thankful for so much of the leading lines of ethnological divergence, without complaining that it is not followed out into its minute ramifications and into all history.

5. The tripartite division in Genesis 10th, indicates a somewhat strict geographical separation of the three main trunks. The regions marked out for Japhet include Europe and North-western Asia. The name Japhet, as well as the statements in the table, indicate a versatile, nomadic, and colonising disposition as characteristic of these tribes.* The Median population, the same with a portion of that now often called Arian,† was the only branch

* Japhet is "enlargement," his sons are Scythians and inhabitants of the isles, varying in language and nationality; and Noah predicts, "God shall enlarge Japhet, he shall dwell in the tents of Shem, Ham shall be his servant." These are surely characteristic ethnological traits for a period so early. On the rationalist view, it may be supposed that this prediction was not written until the characters in question had developed themselves; but since the greatest enlargement of Japhet has occurred since the discovery of America, there would be quite as good ground for maintaining that Noah's prophecy was interpolated after the time of Columbus.

† The language of this people, the stem of the Indo-European languages, is, though in a later form, probably that of the Arian or Persepolitan part of the trilingual inscriptions at Behistun and elsewhere in Persia.

remaining near the original seats of the species, and in a settled condition. The outlying portions of the posterity of Japhet, on account of their wide dispersion, must at a very early period have fallen into comparative barbarism, such as we find in historic periods all over Western and Northern Europe and Northern Asia. Owing to their habitat, the Japhetites of the bible include none of the black races, unless certain Indian and Australian nations are outlying portions of this race. The Shemite nations shewed little tendency to migrate, being grouped about the Euphrates and Tigris valleys and neighbouring regions. For this reason, with the exception of certain Arab tribes, they present no instances of barbarism, and generally retained a high cerebral organization and respectable, though stationary civilization, and they possess the oldest alphabet and literature. The posterity of Ham differs remarkably from the others. It spread itself over Southern Asia and Northern Africa. It established the earliest military and monarchical institutions, and presents at the dawn of history, in Assyria, in Egypt, and India, settled and arbitrary forms in politics and religion of a character so much resembling that of an old and corrupt civilization, that we can scarcely avoid supposing that Ham and his family had preserved more than any of the other Noachian races, the arts and institutions of the old world before the flood. The Hamite race is remarkable for the early development of pantheism and hero-worship, and for the material character of its civilization. It presents us with the darkest colours, and in

the vast solitudes of Africa, its outlying tribes must have fallen into comparative barbarism a few centuries after the deluge. It is farther to be observed, that, according to the Bible, the Canaanites and other Hamite nations spoke languages not essentially different from those of the Shemites, while the Japhetite nations were to them barbarians, "a nation whose tongue thou shalt not understand." There was, too, at the date of the exodus, already a distinction of tongues within each of the great races of men.

6. All the divisions of the family of Noah had from the first the domesticated animals and the principal arts of life, and enjoyed these in a national capacity so soon as sufficiently numerous. The more scattered tribes, wandering into fresh regions, and adopting the life of hunters, lost the characteristics of civilization, and diverged widely from the primitive languages. We should thus have, according to the Hebrew ethnology, a central area presenting the principal stems of all the three races in a permanently civilized state. All around this area should lie aberrant and often barbarous tribes, differing most widely from the original type in the more distant regions, and in those least favourable to human health and subsistence. In these outlying regions, secondary centres of civilization might grow up, differing from that of the primitive centre, except in so far as the common principles of human nature and intercommunication might prevent this. All these conclusions, fairly deducible at once from the Mosaic ethnology and the theory of dispersion from a centre, are perfectly in accordance with observed facts.

A multitude of Bible notices might easily be quoted illustrative of these points, and also of the consistency of the Mosaic narrative with itself. These have often been mentioned by commentators, and one may suffice here. Abraham, who is said by the Jews to have been contemporary with Shem, as Menes by the Egyptians with Ham, at least lived sufficiently near to the time of the rise of the earliest nations, to be taken as an illustration of this primitive condition of society. He was not a patriarch of the first or second rank, like Ham or Mizraim or Canaan, but a subordinate family leader several removes from the survivors of the deluge. Yet his tribe increases in comparatively few years to a considerable number. He is treated as an equal by the monarchs of Egypt and Philistia. He defeats, with a band of three or four hundred retainers, a confederacy of four Euphratean kings representing the embryo state of the Persian and Assyrian empires, and already relatively so strong that they have overrun much of Western Asia. All this bespeaks in a most consistent manner the rapid rise of many small nationalities, scattered over the better parts of wide regions, and still in a feeble condition, though inheriting from their ancestors an old civilization, and laying the foundations of powerful states.

The Hebrew ethnology excels all others in its breadth of conception and freedom from local prejudices. The Egyptians, the Greeks, and probably most other ancient nations, had no true conceptions of the unity of man. Their hero-worship and local polytheism fostered narrow views of the

subject. The Hebrews, with as much national pride as any other people, were restrained by their monotheistic theology from elevating their ancestors into gods, and from worshipping local divinities. They based their claims to eminence on their being the people chosen of God as the depository of his sacred truth, and that truth required them to acknowledge the brotherhood of man. A Jew of Tarsus first maintained this doctrine and its companion one of the vanity of polytheism and merely local religion, before the literati of Athens. Christianity has borne it aloft on its banner over the world, proclaiming the common origin and common destiny of Greek and Jew, Barbarian and Scythian, bond and free. The tenet is a noble one. The tyrant and the slaveholder may well turn pale in its presence, and secretly rejoice if any doubt can be cast on its truth; but no true-hearted lover of his kind, will part with it, unless wrung from him by the compulsion of far stronger arguments than those which I have attempted to review in the previous pages.

I purposely close with this view of the subject, because it brings us back again to the mosaic record. To persons unacquainted with the many forms in which the doctrine of the unity of origin of man has recently been assailed, this chapter may appear unnecessarily prolix. To those who have waded through the ponderous tomes of some modern ethnographers, it may appear a too meagre review. My object has been merely to expose the slenderness of the grounds on which certain theories on this subject have been

built, and the necessity, if natural history is to be called on to bear evidence in the question of unity or diversity of species in man, that patient investigation of the probable extent of his migrations and limits of his variations, should take the place of hasty assumptions of limitation to geographical regions, and of primitive diversity of forms.

CHAPTER XVII.

COMPARISONS AND CONCLUSIONS.

Job xxvi., 14: "Lo these are but outlines of His ways, and how faint the whisper which we hear of Him—the thunder of His power who could understand."

In the preceding pages I have, as far as possible, avoided that mode of treating my subject which was wont to be expressed as the "reconciliation" of Scripture and Natural Science, and have followed the direct guidance of the Mosaic record, only turning aside where some apt illustration or coincidence could be perceived. In the present chapter I propose to enquire what the science of the earth teaches on these same subjects, and to point out certain manifest and remarkable correspondences between these teachings and those of revelation. Here I know that I enter on dangerous ground, and that if I have been so fortunate as to carry the intelligent reader with me thus far, I may chance to lose him now. The Hebrew scriptures are common property; no one can deny me the right to study them, and even if I should appear extreme in some of my views, or venture to be almost as enthusiastic as the commentators of Homer, Shakespeare or Dante, I cannot be very severely blamed. But the direct comparison of these ancient records with results of modern science, is obnoxious

to many minds on very different grounds: and all the more so that so few men are ardent students both of nature and revelation. There are, as yet, but few even of educated men whose range of study has included anything that is practical or useful either in Hebrew literature or geological science. That slipshod christianity which contents itself with supposing that conclusions which are false in nature may be true in theology, is mere superstition or professional priestcraft, and has nothing in common with the Bible; but there are still multitudes of good men, trained in the verbal and abstract learning which at one time constituted nearly the whole of education, who regard geology as a mass of crude hypotheses destitute of coherence, a perpetual battle ground of conflicting opinions, all destined in time to be swept away. It must be admitted too that, from the nature of geological evidence, and from the liability to error in details, the solidity of its conclusions is not likely soon to be appreciated as fully as is desirable by the common mind. On the other hand, the geologist, fully aware of the substantial nature of the foundations of the science of the earth, regards it as little less than absurd to find parallels to its principles in an ancient theological work. Still there are possible meeting points of things so dissimilar as Bible lore and geological exploration. If man is a being connected on the one hand with material nature, and on the other with the spiritual essence of the Creator; if that Creator has given to man powers of exploring and comprehending his plans in the

universe, and at the same time has condescended to reveal to him directly His will on certain points, there is nothing unphilosophical or improbable in the supposition that the same truths may be struck out on the one hand by the action of the human mind on nature, and on the other by the action of the Divine mind on that of man. But few of our greatest thinkers, whether on nature or theology, have reached the firm ground of this higher probability; or if they have reached it, have dreaded the scorn of the half-learned too much to utter their convictions. Still this is a position which the enlightened christian and student of nature must be prepared to occupy, humbly and with admission of much ignorance and incapacity, but with bold assertion of the truth, that there are meeting-points of nature and revelation which afford legitimate subjects of study.

In entering on these subjects, we may receive certain great truths in reference to the history of the earth, as established by geological evidence. In the present rapidly progressive state of the science however, it is by no means easy to separate its assured and settled results from those that have been founded on too hasty generalisation, or are yet immature; and at the same time to avoid overlooking new and important truths, sufficiently established, yet not known in all their dimensions. In the following summary I shall endeavour to present to the reader only well ascertained general truths, without indulging in those deviations from accuracy for effect too often met with in popular books. On the other hand we have already found that

the scriptures enunciate distinct doctrines on many points relating to the earth's early history, to which it will here be necessary merely to refer in general terms. Let us in the first place shortly consider the conclusions of geology as to the origin and progress of creation.

1. The widest and most important generalization of modern geology, is that all the materials of the earth's crust, to the greatest depth that man can reach, either by actual excavation or inference from superficial arrangements, are of such a nature as to prove that they are not, in their present state, original portions of the earth's structure; but that they are results of the operation, during long periods, of the causes of change, whether mechanical, chemical, or vital, now in operation, on the land, in the seas, and in the interior of the earth. For example, the most common rocks of our continents are conglomerates, sandstones, shales and slates; all of which are made up of the debris of older rocks broken down into gravel, sand or mud, and then re-cemented. To these we may add limestones, which have been made up by the accumulation of corals and shells, or by deposits from calcareous springs; coal, composed of vegetable matter; and granite, syenite, greenstone, and trap, which are molten rocks formed in the manner of modern lavas. So general has been this sorting, altering, and disturbance of the substance of the earth's crust, that, though we know its structure over large portions of our continents, to the depth of several miles, the geologist can point to no instance of a truly primitive rock

which can be affirmed to have remained unchanged and in situ since the beginning.

"All are aware that the solid parts of the earth consist of distinct substances, such as clay, chalk, sand, limestone, coal, slate, granite, and the like; but, previously to observation, it is commonly imagined that all had remained from the first in the state in which we now see them—that they were created in their present forms and in their present position. The geologist now comes to a different conclusion; discovering proofs that the external parts of the earth were not all produced in the beginning of things, in the state in which we now behold them, nor in an instant of time. On the contrary, he can show that they have acquired their actual condition and configuration gradually, and at successive periods, during each of which distinct races of living beings have flourished on the land and in the waters; the remains of these creatures still lying buried in the crust of the earth." *

2. Having ascertained that the rocks of the earth have thus been produced by secondary causes, we next affirm, on the evidence of geology, that a distinct order of succession of these deposits can be ascertained; and though there are innumerable local variations in the nature of rocks formed at the same period, yet there is, on the great scale, a regular sequence of formations over the whole earth. This succession is of the greatest importance in the case of aqueous rocks, or those formed in water; and it is evident

* Lyell's Manual of Elementary Geology.

that in the case of beds of sand, clay, &c., deposited in this way, the upper must be the more recent of any two layers. This simple principle, complicated in various ways by the fractures and disturbances to which the beds have been subjected, forms the basis of the succession of "formations" in geology.

3. This regular series of formations would be of little value as a history of the earth, were it not that nearly all the aqueous rocks contain remains of the contemporary animals and plants. Ever since the earth began to be tenanted by organised beings, the various accumulations formed in the bottoms of seas and at the mouths of rivers, have entombed remains of marine animals, more especially their harder parts, as shells, corals and bones, and also fragments or entire specimens of land animals and plants. Hence, in any rock of aqueous formation, we may find fossil remains of the living creatures that existed in the waters in which that rock was accumulated or on the neighbouring land. If in the process of building up the continents, the same locality constituted in succession a part of the bottom of the ocean, of an inland sea, of an estuary and a lake, we should find, in the fossil remains entombed in the deposits of that place, evidences of these various conditions; and thus a somewhat curious history of local changes might be obtained. Geology affords more extensive disclosures of this nature. It shows, that, as we descend into the older formations, we gradually lose sight of the existing animals and plants, and find the remains of

others not now existing; and these, in turn, themselves disappear, and were preceded by others; so that the whole living population of the earth appears to have been several times renewed, prior to the beginning of the present order of things.

In the sediment *now* accumulating in the bottom of the waters, are being buried remains of the existing animals and plants. A geological formation is being produced, and it contains the skeletons and other solid parts of a vast variety of creatures belonging to all climates, and which have lived on land as well as in fresh and salt water. Let us now suppose that by a series of changes, sudden or gradual, all the present organised beings were swept away, and that, when the earth was renewed by the fiat of the Creator, a new race of intelligent beings could explore those parts of the former sea basins that had been elevated into land. They would find the remains of multitudes of creatures not existing in their time; and by the presence of these they could distinguish the deposits of the former period from those that belonged to their own. They could also compare these remains with the corresponding parts of creatures which were their own contemporaries, and could thus infer the circumstances in which they had lived, the modes of subsistence for which they had been adapted, and the changes in the distribution of land and water and other physical conditions which had occurred. This, then, is precisely the place which fossil organic remains occupy in modern geology, except that our present system of na-

ture rests on the ruins, not of one previous system, but of several.

4. By the aid of the superposition of deposits and their organic remains, geology can mark out the history of the earth into distinct periods. These periods are not separated by merely arbitrary boundaries, but to some extent mark important eras in the progress of our earth, though they usually pass into each other at their confines, and the nature of the evidence prevents us from ascertaining the precise length of the periods themselves, or the intervals in time which may separate the several monuments by which they are distinguished. The following table will serve to give an idea of the arrangement at present generally received, with some of the more important facts in the succession of animal and vegetable life, as connected with our present subject. It commences with the oldest periods known to geology, and gives in the animal and vegetable kingdoms the *first appearance* of each class, with a few notes of the subsequent history of the principal forms :—

PERIODS.	SYSTEMS OF FORMATIONS.	CLASSES OF ANIMALS.	PLANTS.
I. AZOIC PERIOD.	Ancient Metamorphic rocks of Scandinavia, Canada, &c.		
II. PRIMARY OR PALAEOZOIC PERIOD.	Cambrian ..	*Radiata*—Hydrozoa (?) *Mollusca*—Brachiopoda. *Articulata*—Annelida, Crustacea.	Algae.

PERIODS.	SYSTEMS OF FORMATIONS.	CLASSES OF ANIMALS.	PLANTS.
II. PRIMARY OR PALAEOZOIC *Continued.*	Silurian, ...	*Radiata*—Protozoa, Anthozoa, Echinodermata *Mollusca*—Polyzoa, Tunicata, Lamellibranchiata, Gasteropoda, Pteropoda, Cephalopoda. *Vertebrata*—*Fishes* at close of period.	Acrogenous Land plants?
	Devonian,...	*Vertebrata*—Fishes, Ganoid and Placoid—Reptiles (?)	Acrogens. and Gymnosperms.
	Carboniferous,.....	*Mollusca*—Pulmonata, *Articulata*—Insects, Arachnidans. *Vertebrata*--Batrachians, prevalent.	Acrogens, Gymnosperms, Endogens?
	Permian, ..	*Vertebrata* — Lacertian Reptiles.	
III. SECONDARY OR MESOZOIC PERIOD.	Triassic,....	*Vertebrata*—Higher Reptiles prevalent; Birds.	
	Jurassic, ...	*Vertebrata* — Great prevalence of higher Reptiles; Fishes, homocerque; Marsupial Mammals.	Endogenous trees
	Cretaceous,	*Vertebrata* — Decadence of reign of Reptiles.	Angiospermous Exogens.
IV. TERTIARY OR CAINOZOIC PERIOD.	Eocene, ...	*Vertebrata*—Mammals prevalent, especially Pachyderms, Cycloid and Ctenoid fishes. First *living* Invertebrates.	Exogens prevalent.
	Miocene,....	Living Invertebrates more numerous.	
	Pliocene,...	Living Invertebrates still more numerous.	
V. POST TERTIARY OR MODERN.	Post Pliocene, ...	First living Mammals. Living Invertebrates prevalent.	Existing vegetation.
	Recent,.....	Man & Living Mammals.	

The oldest fossil remains known belong to extinct species of zoophytes, shell-fish and crustaceans, and the algae or sea-weeds. In the Palaeozoic period, though reptiles existed towards its close, the higher orders of fishes seem to have been the dominant tribe of animals; and vegetation was nearly limited to cryptogams and gymnosperms. In the Mesozoic period, though small mammalia had been created, large terrestrial and marine reptiles were the ruling race, and fishes occupied a subordinate position; while, at the close, the higher orders of plants took a prominent place. In the tertiary and modern eras, the mammalia, with man, have assumed the highest place. On this series of groups, and the succession of living beings, Sir C. Lyell remarks—"It is not pretended that the principal sections called primary, secondary and tertiary, are of equivalent importance, or that the subordinate groups comprise monuments relating to equal portions of time or of the earth's history. But we can assert that they each relate to successive periods, during which certain animals and plants for the most part peculiar to their respective eras, flourished, and during which different kinds of sediment were deposited."

5. The lapse of time embraced in the geological history of the earth is enormous. Fully to appreciate this, it is necessary to study the science in detail, and to explore its phenomena as disclosed in actual nature. A few facts, however, out of hundreds which might have been selected, will suffice to indicate the state of the case. The delta and allu-

vial plain of the Mississippi, belong to the post-pliocene or modern period. Taking in connection the mass of matter in the delta and the known rate of deposition by the river, we are obliged to admit that the period occupied in the deposition of this mass of muddy sediment must have extended to "many ten thousands of years."* To be quite safe, let us take 40,000 years. We may then safely multiply this number by ten for the length of the tertiary period. We may add as much more for the mesozoic period, and this will be far under the truth. It will then be quite safe to assume that the palaeozoic period was as long as the mesozoic and tertiary together. Great though these demands may seem, they are probably far below the rigid requirements of the case.† Take another illustration from another formation. An excellent coast section at the Joggins in Nova Scotia, exhibits in the coal formation proper, a series of beds with erect trunks and roots of trees in situ, amounting to nearly 100. About 100 forests have successively grown, partially decayed and been entombed in muddy and sandy sediment. In the same section, including in all about 14,000 feet of beds, there are 76 seams of coal, each of which can be proved to have taken more time for its accumulation than that required for the growth of a forest.

* Lyell.

† A perfectly parallel example is that of the growth of the peninsula of Florida in the modern period, by the same processes now adding to its shores, and this has afforded to Prof. Agassiz a still more extended measure of the Post tertiary period.

Supposing all these separate fossil soils and coals to have been formed with the greatest possible rapidity, ten thousand years would be a very moderate calculation for this portion of the carboniferous system; and for aught that we know, thousands of years may be represented by a single fossil soil. But this is the age of only one member of the carboniferous system, itself only a member of the great palaeozoic group, and we have made no allowance for the abrasion from previous rocks and deposition of the immense mass of sandy and muddy sediment in which the coals and forests are imbedded, and which is vastly greater than the deltas of the largest modern rivers. Thus, then, we find that the earth in its present state is the product of changes which have proceeded probably during countless years, yet we have no geological evidence that even this great lapse of time carries us back to that beginning revealed in scripture, in which the materials of the universe sprang into being at the word of God.

6. During the whole time referred to by geology, the great laws both of inorganic and organic nature have been the same as at present. The evidence of light and darkness, of sunshine and shower, of summer and winter, and of all the known igneous and aqueous causes of change, extends back almost, and in some of these cases altogether, to the beginning of the palaeozoic period. In like manner the animals and plants of the oldest rocks are constructed on the same physiological and anatomical principles with existing tribes, and they can be arranged in the same

genera, orders or classes, though specifically distinct. The revolutions of the globe have involved no change of the general laws of matter; and though it is possible that geology has carried us back to the time when the laws that regulate life began to operate, it does not show that they were less perfect than now, and it indicates no trace of the beginning of the inorganic laws. Geological changes have resulted not from the institution of new laws, but from new *dispositions*, under existing laws and general arrangements. There is every reason to believe that in the inorganic world these dispositions have required no new creative interpositions during the time to which geology refers, but merely the continued action of the properties bestowed on matter when first produced. In the organic world the case is different.

7. In the succession of animal and vegetable life we find instances of improvement and advance by the introduction of new types of being, but not of development of one species from another. We have already given a general outline of this advancement of organised nature. It has consisted in the creation, from time to time, of new and more highly organised beings, so as at once to increase the variety of nature, and to provide for the elevation of the summit of the graduated scale of life to higher and higher points. For instance, in the earlier palaeozoic period, we have molluscous animals and fishes, then apparently the highest forms of life, appearing with a very advanced organization, not surpassed, if even equalled, in

modern times. In the later part of the same great period, some lower forms of vegetable life, now restricted to a comparatively humble place, were employed to constitute magnificent forests. In the Mesozoic period again, reptiles attained to their highest point in organization and variety of form and employment, while mammalia had as yet scarcely appeared.*

* I am quite aware that it may be objected to all this that it is based on merely negative evidence; but this is not strictly the case. There are positive indications of these truths. For example, in the Mesozoic epoch, the lacertian reptiles presented huge elephantine, carnivorous and herbivorous species, the Megalosaurus, Iguanodon, &c.; flying species, with hollow bones and ample wings, the Pterodactyles; and aquatic whale-like species, Cetiosaurus, Ichthyosaurus, &c. These creatures actually filled the offices now occupied by the mammals; and, though lacertian in their affinities, they must have had circulatory, respiratory, and nervous systems far in advance of any modern reptiles even of the order of Loricates. Even comparative anatomists have given to this view of the subject less attention than it deserves; and the author was once taken to task for an assertion of this nature, by one of our ablest living naturalists, to whom it did not appear to have occurred that a Dinosaurian walking the earth with elephantine tread, or a Pterodactyl cleaving the air with rapid wings, must necessarily have enjoyed a far more perfect circulation and respiration than the highest living reptiles, and so have approached more nearly to the mammals and birds, and have been fitted to fill their offices, to their exclusion.

These and similar facts have obliged geologists to admit that the advance of organic nature must have been the result of direct creative interposition. Hence we find that geology, which, more than any other science, has been accused of infidel tendency, is the only one which leads us directly into the presence of the Author of nature, and finds itself obliged, in order to account for the phenomena which it observes, to have recourse to the "Miracle of Creation." I cannot better close this head and this part of the subject, than by quoting some of the views expressed by leading geologists, on this important part of the relations of geology to revelation.

Prof. Pictet of Geneva, a very able and careful palaeontologist, in the introduction to his "Traite de Palaeontologie," as translated for the Journal of the Geological Society, remarks:—

"It seems to me impossible that we should admit as an explanation of the phenomena of successive faunas, the passage of species into one another; the limits of such transitions of species, even supposing that the lapse of a vast period of time may have given them a character of reality much greater than that which the study of existing nature leads us to suppose, are still infinitely within those differences which distinguish two successive faunas. Lastly, we can least of all account by this theory for the appearance of new *types*, to explain the introduction of which we must necessarily, in the present state of science, recur to the idea of distinct creations posterior to the first."

Hugh Miller, in his "Footprints of the Creator," thus strongly asserts the same view:—

"With the introduction of man into the scene of existence, creation, I repeat, seems to have ceased. What is it that now takes its place and performs its work? During the previous dynasties, all elevation in the scale was an effect simply of creation. Nature lay dead in a waste theatre of rock, vapour and sea; in which the insensate aws, chemical, mechanical and electric, carried on their blind, unintelligent processes. The *creative fiat* went forth, and amid waters that straightway teemed with life in its lowest forms, vegetable and animal, the dynasty of the fish was introduced. Many ages passed, during which there took place no further elevation; on the contrary, in not a few of the newly introduced species of the reigning class, there appeared for the first time examples of a symmetrical misplacement of parts; and, in at least one family of fishes, instances of defect of parts. There was the manifestation of a downward tendency toward the degradation of monstrosity, when the elevatory fiat again went forth, and, through an act of creation, the dynasty of the reptile began. Again many ages passed by, marked apparently by the introduction of a warm-blooded oviparous animal, the bird, and a few marsupial quadrupeds; but in which the prevailing class reigned undeposed, though at least unelevated. Yet again, however, the elevatory fiat went forth, and, through an act of creation, the dynasty of the mammiferous quadruped began. And, after the further lapse of ages, the elevatory fiat went forth yet once more in an

act of creation, and with the human, heaven-aspiring dynasty, the moral government of God, in its connection at least with the world which we inhabit, "took beginning"; and then creation ceased. Why?—simply because God's moral government *had* begun."

Sir C. Lyell, in an Anniversary Address as President of the Geological Society (1851), largely and ably discusses the subject of progressive development and introduction of types and species. There is probably no geologist of our day more favourably situated for sketching the present aspect of geology in reference to these great principles, or more fully possessing the wide range of knowledge and thought necessary for the task. His views differ in some points from those just quoted, but their general tendency is the same:—

"If, therefore, the doctrine of successive development had been palaeontologically true, as I have endeavoured to show that it is not; if the sponge, the cephalopod, the fish, the reptile, the bird and the mammifer, had followed each other in regular chronological order, the creation of each of these classes being separated from the others by vast intervals of time; and if it were clear that man had been created later by at least one entire period,—still I should have been wholly unable to recognize, in his entrance on the earth, the last term of one and the same series of developments. Even then the creation of man would rather seem to have been the beginning of some new and different order of things. * * By the creation of a species I simply mean the beginning of a new series of organic

phenomena, such as we usually understand by the term "species." Whether such commencement be brought about by the direct intervention of the First Cause, or by some unknown second cause or law appointed by the Author of nature, is a point upon which I will not venture to offer a conjecture.

"In the first publication of the Huttonian theory, it was declared that we can neither see the beginning nor the end of that vast series of phenomena which it is our business as geologists to investigate. After sixty years of renewed inquiry, and after we have greatly enlarged the sphere of our knowledge, the same conclusion seems to me to hold true. But if any one should appeal to such results in support of the doctrine of an eternal succession, I may reply that the evidence has become more and more decisive in favour of the recent origin of our own species. The intellect of man and his spiritual and moral nature are the highest works of creative power known to us in the universe; and to have traced out the date of their commencement in past time,—to have succeeded in referring so memorable an event to one out of a long succession of periods, each of enormous duration,—is perhaps a more wonderful achievement of science than it would be to have simply discovered the dawn of animal or vegetable life, or the precise time when out of chaos or out of nothing, a globe of inanimate matter was first formed." *

* It appears for some years past to have become a recognized practice of the Presidents of the Geological Society, in their annual addresses, to devote a few concluding paragraphs to

The actual position of geology in relation to the succession of organic life and the creation of species, cannot be more shortly or clearly stated than in the following propositions by Dr. Bronn, in his essay on the "Laws of Development of the Organic World," to which the prize was awarded by the French Academy in 1856. I quote from the translation in the notice of the work by Mr. Hamilton,

such general subjects. In 1852, Mr. Hopkins vindicated the doctrine of the progression of the *inorganic* arrangements of the earth, from the period of its first creation. In 1854, Prof. Forbes introduced his remarkable doctrine of polarity in the introduction of organic forms, which, had he lived, he might have followed out into other general views. Its bearing on our subject is merely that it is a hint toward the tracing of a general plan in creation, of such a character, that, while generic forms were more plentifully developed at the beginning of the Palaeozoic and more sparingly toward its close, the reverse mode appears in the Mesozoic and Tertiary. In 1856, Mr. Hamilton ably exposed the fallacies of Prof. Powell's reasonings on the supposed infinite variability of species. In 1857, Major-General Portlock, while protesting against the limitation of scientific inquiry by any views of the Bible narrative, maintains the creation of species by the Divine fiat, locally, and in adaptation to the circumstances of their several localities. In 1858, he attacks, perhaps too severely, Mr. Gosse's ingenious but eccentric theory. It is instructive to observe how carefully these men, writing for the most advanced geological minds, touch on the mystery of creation, and how little in the main their views as to its probable nature differ from the doctrines of revelation.

in the Journal of the Geological Society of London, Feb. 1859:—

"1. The first productions of this power in the oldest Neptunian strata of the earth consisted of Plants, Zoophytes, Molluscs, Crustaceans, and perhaps even Fish; the simultaneous appearance of which, therefore, contradicts the assumption that the more perfect organic forms arose out of the gradual transformation in time of the more imperfect forms.

"2. The same power which produced the first organic forms has continued to operate in intensively as well as extensively increasing activity during the whole subsequent geological period, up to the final appearance of man: but here also can no traces be found of a gradual transformation of old species and genera into new; but the new have everywhere appeared as new without the co-operation of the former.

"3. In the succession of the different forms of plants and animals, a certain regular course and plan is perceptible, which is quite independent of chance. Whilst all species possess only a limited duration, and must sooner or later disappear, they make way for subsequent new ones, which not only almost always offer an equivalent, in number, organization, and duties to be performed, for those which have disappeared, but which are also generally more varied, and therefore partly more perfect, and always maintain an equilibrium with each other in their stage of organization, their mode of life, and functions. There

always exists, therefore, a certain fixed relation between the newly arising and the disappearing forms of organic life.

"4. A similar relation necessarily exists between the newly arising organic forms and the outward conditions of life which prevailed at their first appearance on the earth's surface, or at the place of their appearance.

"5. A fixed plan appears to be the basis of the whole series of development of organic forms, in so far as man makes his first appearance at its close, when he finds everything prepared that is necessary to his own existence and to his progressive development and improvement,—which would not have been possible had he appeared at a former period.

"6. Such a regular progress in carrying out the same plan from the beginning to the end of a period of millions of years can only be accounted for in one of two ways. Either this course of successive development during millions of years has been the regular immediate result of the systematic action of a conscious Creator, who on every occasion settled and carried out not only the order of appearance, formation, organization, and terrestrial object of each of the countless numbers of species of plants and animals, but also the number of the first individuals, the place of their settlement in every instance, although it was in his power to create everything at once,—or there existed some natural power hitherto entirely unknown to us, which by means of its own laws formed the species of plants and

animals, and arranged and regulated all those countless individual conditions; which power, however, must in this case have stood in the most immediate connexion with, and in perfect subordination to, those powers which caused the gradually progressing perfection of the crust of the earth, and the gradual development of the outward conditions of life for the constantly increasing numbers and higher classes of organic forms in consequence of this perfection. Only in this way can we explain how the development of the organic world could have regularly kept pace with that of the inorganic. Such a power, although we know it not, would not only be in perfect accordance with all the other functions of nature, but the Creator, who regulated the development of organic nature by means of such a force so implanted in it, as he guides that of the inorganic world by the mere co-operation of attraction and affinity, must appear to us more exalted and imposing, than if we assumed that he must always be giving the same care to the introduction and change of the vegetable and animal world on the surface of the earth as a gardener daily bestows on each individual plant in the arrangement of his garden.

"7. We therefore believe that all species of plants and animals were originally produced by some natural power unknown to us, and not by transformation from a few original forms, and that that power was in the closest and most necessary connexion with those powers and circumstances which effected the perfection of the earth's surface."

It will be observed that this author, while rejecting the transmutation of species, and insisting on a definite plan harmonizing organic and physical existence in all their mutations, leans to the idea of a creative *law* rather than to that of creative *acts;* but this is really little more than a verbal difference. These principles lead also to the grand idea, that the plan of the Creator in the organic world was so vast that it required the whole duration of our planet, in all its stages of physical existence, to embrace the whole. There is but one system of organic nature; but, to exhibit the whole of it, not only all the climates and conditions now existing are required, but those also of all past geological periods. Further, the progress of nature being mainly in the direction of differentiation of functions once combined, it has a limit backward in the most general forms and conditions, and forward in the most specialized. This is the history of the individual and probably also of the type, of the world itself and of the universe; and for this reason material nature necessarily lacks the eternity of its author.*

It appears, from the above facts and reasonings, that geology informs us—1. That the materials of our existing continents are of secondary origin, as distinguished from primitive, or coeval with the beginning. 2. That a chro-

* The reader will find further views of this subject in the conclusion of Murchison's "Siluria," and in Agassiz's contributions to the Natural History of America. See also Appendix F.

nological order of formation of these rocks can be made out. 3. That the fossil remains contained in the rocks, constitute a chronology of animal and vegetable existence. 4. That the history of the earth may be divided in this way into distinct periods, all pre-Adamite. 5. That the pre-Adamite periods were of enormous duration. 6. That during these periods, the existing general laws of nature were in force, though the dispositions of inorganic nature were different in different periods, and the animals and plants of successive periods were also different from each other. 7. The introduction of new species of animals and of plants, while indicating advance in the perfection of nature, does not prove spontaneous development, but rather creation.

The parallelism of these conclusions of careful inductive inquiry into the structure of the earth's crust, with the results which we have already obtained from revelation, may be summed up under the following heads:—

1. Scripture and Science both testify to the great fact that there was a beginning—a time when none of all the parts of the fabric of the universe existed; when the Self-Existent was the sole occupant of space. The scriptures announce in plain terms this great truth, and thereby rise at once high above atheism, pantheism, and materialism, and lay a broad and sure foundation for a pure and spiritual theology. Had the pen of inspiration written but the words, "In the beginning God created the heaven and the earth," and added no more, these words alone would

have borne the impress of their heavenly birth, and would, if received in faith, have done much for the progress of the human mind. These words contain a negation of hero-worship, star-worship, animal-worship, and every other form of idolatry. They still more emphatically deny atheism and materialism, and point upward from nature to its spiritual Creator—the One, the Triune, the Eternal, the Self-Existent, the All-Pervading, the Almighty. They call upon us, as with a voice of thunder, to bow down before that Awful Being of whom it can be said, that He created the heavens and the earth. They thus embody the whole essence of natural theology, and most appropriately stand at the entrance of Holy Scripture, referring us to the works which men behold, as the visible manifestation of the attributes of the Being whose spiritual nature is unveiled in revelation. Scripture thus begins with the announcement of a great ultimate fact, to which science conducts us with but slow and timid steps. Yet science, and especially geological science, can bear witness to this great truth. The materialist, reasoning on the fancied stability of natural things, and their inscription within invariable laws, concludes that matter must be eternal. No, replies the geologist, certainly not in its present form. This is but of recent origin, and was preceded by other arrangements. Every existing species can be traced back to a time when it was not; so can the existing continents, mountains and seas. Under our processes of investigation, the present melts away like a dream, and we are landed

on the shores of past and unknown worlds. But I read, says the objector, that you can see "no evidence of a beginning, no prospect of an end." It is true, answers geology; but, in so saying, it is not intended that the present state of things had not an ascertained beginning, but that there has been a great, and, so far as we know, unlimited, series of changes carried on under the guidance of intelligence. These changes we have traced back very far, without being able to say that we have reached the first. We can trace back man and his contemporaries to their origin, and we can reach the points at which still older dynasties of life began to exist. Knowing, then, that all these had a beginning, we infer that if others preceded them they also had a beginning. But, says another objector, is not the present the child of the past? Are not all the creatures that inhabit the earth the lineal descendants of creatures of past periods, or may not the whole be parts of one continual succession, under the operation of an eternal law of development? No, answers geology, species are immutable, except within narrow limits, and do not pass into each other, in tracing them toward their origin. On the contrary, they appear at once in their most perfect state, and continue unchanged till they are forced off the stage of existence to give place to other creatures. The origin of species is a mystery, and belongs to no natural law that has yet been established. Thus, then, stands the case at present. Scripture asserts a beginning and a creation. Science admits these, as far as the objects with

which it is conversant extend, and the notions of eternal succession and spontaneous development, discountenanced both by theology and science, are obliged to take refuge in those misty regions where modern philosophical skepticism consorts with the shades of departed heathenism.

2. Both records exhibit the progressive character of creation, and in much the same aspect. The Almighty might have called into existence, by one single momentary act, a world complete in all its parts. From both scripture and geology we know that he has not done so;—why we need not inquire, though we can see that the process employed was that best adapted to show forth the variety of his resources, and the infinitely varied elements that enter into the perfect whole.

The scripture history may be viewed as dividing the progress of the creation into two great periods, the later of which only is embraced in the geological record. The first commences with the original chaos, and reaches to the completion of inorganic nature on the fourth day. Had we any geological records of the first of these periods, we should perceive the evidences of slow mutations, tending to the sorting and arrangement of the materials of the earth, and to produce distinct light and darkness, sea and land, atmosphere and cloud, out of what was originally a mixture of the whole. We should also, according to the scriptural record, find this period interlocking with the next, by the intervention of a great vegetable creation, before the final adjustment of the earth's relations to the

other bodies of our system. The second period is that of the creative development of animal life. From both records we learn that various ranks or gradations existed from the first introduction of animal life, but that on the earlier stages, only certain of the lower forms of animals were present, but these soon attained their highest point; and then gradually, on each succeeding platform, the variety of nature in its higher—the vertebrate—form increased, and the upper margin of animal life attained a more and more elevated point, culminating at length in man; while certain of the older forms were dropped, as no longer required.

In the very oldest fossiliferous rocks, e.g. the Lower Silurian or Cambrian, we find the mollusca represented mainly by their highest and lowest classes, by allies of the cuttle-fish and nautilus, and by the lowest bivalve shell-fishes. The articulata are represented by the highest marine class, the crustaceans, and by the lowest, the worms, which have left their marks on some of the lowest fossiliferous beds. The Radiata, in like manner, are represented by species of their highest class, the star-fishes, &c., and by some of their simpler polyp forms. At the very beginning, then, of the fossiliferous series, the three lower sub-kingdoms exhibit species of their most elevated aquatic classes, though not of the very highest orders in those classes. The vertebrated sub-kingdom has, as far as yet known, no representative in these lowest beds. In the Upper Silurian series, however, we find remains of fishes; and in the succeeding Devonian and Carboniferous rocks,

the fishes rise to the highest structures of their class; and we find several species of reptiles, representing the next of the vertebrated classes in ascending order. Here a very remarkable fact meets us. Before the close of the Palaeozoic period, the three lower sub-kingdoms and the fishes, had already attained the highest perfection of which their types are capable. Multitudes of new species and genera were added subsequently, but none of them rising higher in the scale of organization than those which occur in the Palaeozoic rocks. Thenceforth, the progressive improvement of the animal kingdom consisted in the addition, first of the reptile, which attained its highest perfection and importance in the Mesozoic period, and then of the bird and mammal, which did not attain their highest forms till the modern period. This geological order of animal life, it is scarcely necessary to add, agrees perfectly with that sketched by Moses, in which the lower types are completed at once, and the progress is wholly in the higher.

In the inspired narrative, we have already noticed some peculiarities, as for instance the early appearance of a highly developed flora, and the special mention of great reptiles in the work of the fifth day, which correspond with the significant fact that high types of structure appeared at the very introduction of each new group of organized beings—a fact which, more than any other in geology, shows that, in the organic department, elevation has always been a strictly *creative* work, and that there is in the constitution of animal species no innate tendency

to elevation, but that on the contrary we should rather suspect a tendency to degeneracy and ultimate disappearance, requiring that the fiat of the Creator should after a time go out again to "renew the face of the earth." In the natural as in the moral world, the only law of progress is the will and the power of God. In one sense, however, progress in the organic world has been dependent on, though not caused by, progress in the inorganic. We see in geology many grounds for believing, that each new tribe of animals or plants was introduced just as the earth became fitted for it; and even in the present world, we see that regions composed of the more ancient rocks, and not modified by subsequent disturbances, present few of the means of support for man and the higher animals; while those districts in which various revolutions of the earth have accumulated fertile soils, or deposited useful minerals, are the chief seats of civilization and population. In like manner, we know that those regions which the Bible informs us were the cradle of the human race, and the seats of the oldest nations, are geologically among the most recent parts of the existing continents, and were no doubt selected by the Creator partly on that account, for the birth-place of man. We thus find that the Bible and the Geologists are agreed not only as to the fact and order of progress, but also as to its manner and use.

3. Both records agree in affirming that since the beginning there has been but one great System of nature. We can imagine it to have been otherwise. Our existing

nature might have been preceded by a state of things having no connection with it. The arrangements of the earth's surface might have been altogether different; races of creatures might have existed having no affinity with or resemblance to those of the present world, and we might have been able to trace no present beneficial consequences as flowing from these past states of our planet. Had geology made such revelations as these, the consequences in relation to natural theology and the credibility of scripture, would have been momentous. The Mosaic narrative could scarcely, in that case, have been interpreted in such a manner as to accord with geological conclusions. The questions would have arisen,—Are there more creative powers than one? If one, is he an imperfect or capricious being who changes his plans of operation? The divine authority of the scriptures, as well as the unity and perfections of God, might thus have been involved in serious doubts. Happily for us, there is nothing of this kind in the geological history of the earth; as there is manifestly nothing of it in that which is revealed in scripture.

In the scripture narrative, each act of creation prepares for the others, and in its consequences extends to them all. The inspired writer announces the introduction of each new part of creation, and then leaves it without any reference to the various phases which it assumed as the work advanced. In the grand general view which he takes, the land and seas first made represent those of all the following periods. So do the first plants, the first

invertebrate animals, the first fishes, reptiles, birds, and mammals. He thus assures us, that, however long the periods represented by days of creation, the system of nature was one from the beginning. In like manner, in the geological record, each of the successive conditions of the earth is related to those which precede and those which follow, as part of a series. So also a uniform plan of construction pervades organic nature, and uniform laws the inorganic world in all periods. We can thus include in one system of natural history, all animals and plants, fossil as well as recent; and can resolve all inorganic changes into the operation of existing laws. The former of these facts is in its nature so remarkable, as almost to warrant the belief of special design. Naturalists had arranged the existing animals and plants, without any reference to fossil species, in kingdoms, sub-kingdoms, classes, orders, families and genera. Geological research has added a vast number of species not now existing in a living state; yet all these fossils can be inserted within the limits of recognized groups. We do not require to add a new kingdom sub-kingdom, or class; but on the contrary, all the fossil genera and species go into the existing divisions, in such a manner as to fill them up precisely where they are most deficient, thus occupying what would otherwise be gaps in the existing system of nature. The principal difficulty which they occasion to the zoologist and botanist, is that by filling the intervals between genera previously widely separated, they give to the whole a degree of con-

tinuity, which renders it more difficult to decide where the boundaries separating the groups should be placed.

We also find that the animals and plants of the earlier periods often combined in one form, powers and properties, afterwards separated in distinct groups; thus in the earlier formations, the sauroid fishes unite peculiarities afterwards divided between the fish and reptiles, constituting what Agassiz calls a synthetic type. Again, the series of creatures in time accords with the ranks which a study of their types of structure induces the Naturalist to assign them in his system; and also, within each of the great sub-kingdoms, presents many points of accordance with the progress of the embryonic development of the individual animal. Nor is this contradictory to the statement that the earlier representatives of types are often of high and perfect organization, for the progress both in geological time and in the life of the individual, is so much one of specialization, that an immature animal often presents points of affinity to higher forms that disappear in the adult. In connection with this, earlier organic forms often appear to fore-shadow and predict others that are to succeed them in time, as the winged and marine reptiles of the Mesozoic rocks, the birds and the cetaceans. Agassiz has admirably illustrated these links of connection between the past and the present, in the essay on classification prefixed to his "Contributions to the Natural History of America." In reference to "prophetic" types, he says:—"They appear now like a prophecy in those earlier times of an order of things not

possible with the earlier combinations then prevailing in the animal kingdom, but exhibiting in a later period, in a striking manner, the antecedent consideration of every step in the gradation of animals."

4. The periods into which geology divides the history of the earth, are different from those of scripture, yet when properly understood, there is a marked correspondence. Geology refers only to the fifth and sixth days of creation, or at most, to these with parts of the fourth and seventh, and it divides this portion of the work into several eras, founded on alternations of rock formations and changes in organic remains. The nature of geological evidence renders it probable that many apparently well-marked breaks in the chain, may result merely from deficiency in the preserved remains; and consequently that what appear to the geologist to be very distinct periods, may in reality run together. The only natural divisions that scripture teaches us to look for, are those between the fifth and sixth days, and those which, within these days, mark the introduction of new animal forms, as for instance the great reptiles of the fifth day. We have already seen that the beginning of the fifth day can be referred almost with certainty to that of the Palaeozoic period. The beginning of the sixth day may with nearly equal certainty be referred to that of the Tertiary era. The introduction of great reptiles and birds in the fifth day, synchronizes and corresponds with the beginning of the Mesozoic period; and that of man at the close of the sixth day, with the

commencement of the modern era in geology. These four great coincidences are so much more than we could have expected, in records so very different in their nature and origin, that we need not pause to search for others of a more obscure character. It may be well to introduce here a tabular view of this correspondence between the Geological and Biblical periods, extending it as far as either record can carry us:—

PARALLELISM OF THE SCRIPTURAL COSMOGONY WITH THE ASTRONOMICAL AND GEOLOGICAL HISTORY OF THE EARTH.

BIBLICAL AEONS.	PERIODS DEDUCED FROM SCIENTIFIC CONSIDERATIONS.
The Beginning.	Creation of Matter.
First Day.—Earth mantled by the Vaporous Deep—Production of Light.	Condensation of Planetary Bodies from a nebulous mass—Hypothesis of original incandescence.
Second Day.—Earth covered by the Waters.—Formation of the Atmosphere.	Primitive Universal Ocean, and establishment of Atmospheric equilibrium.
Third Day.—Emergence of Dry Land—Introduction of Vegetation.	Elevation of the land which furnished the materials of the Azoic rocks—Azoic Period of Geology.
Fourth Day. — Completion of the arrangements of the Solar System.	Metamorphism of Azoic rocks and disturbances preceding the Cambrian epoch—Dominion of "Existing Causes" begins.
Fifth Day.—Invertebrates and Fishes, and afterwards great Reptiles and Birds created.	Palaeozoic Period — Reign of Invertebrates and Fishes. Mesozoic Period—Reign of Reptiles.

BIBLICAL AEONS.	PERIODS DEDUCED FROM SCIENTIFIC CONSIDERATIONS.
Sixth Day. — Introduction of Mammals—Creation of Man and Edenic Group of Animals.	Tertiary Period--Reign of Mammals. Post Tertiary—Existing Mammals and Man.
Seventh Day. — Cessation of Work of Creation—Fall and Redemption of Man.	Period of Human History.
Eighth Day. — New Heavens and Earth to succeed the Human Epoch—"The Rest (Sabbath) that remains to the People of God."*	

* Heb. IV., 9, 2 Peter III. 13.

5. In both records the ocean gives birth to the first dry land, and it is the sea that is first inhabited, yet both lead at least to the suspicion that a state of igneous fluidity preceded the primitive universal ocean. In scripture the original prevalence of the ocean is distinctly stated, and all geologists are agreed that, in the early fossiliferous periods, the sea must have prevailed much more extensively than at present. Scripture also expressly states that the waters were the birth-place of the earliest animals, and geology has as yet discovered in the whole Silurian series no terrestrial animal, though marine creatures are extremely abundant; and though air-breathing creatures are found in the later Palaeozoic, they are, with the exception of insects, of that semi-amphibious character, which is proper to alluvial flats and the deltas of rivers. It is true that the negative evidence collected by geology does not render it altogether impossible that terrestrial animals,

even mammals, may have existed in the earliest periods; yet there are, as already pointed out, some positive indications of this kind. The scripture, however, commits itself to a positive statement that the higher land animals did not exist so early, though it must be observed that there is nothing in the Mosaic narrative adverse to the existence of birds, insects and reptiles, in the earlier Palaeozoic periods. Though, however, the Bible informs us of a universal ocean preceding the existence of land, it also gives indications of a still earlier period of igneous fluidity or gaseous expansion. Geology also and astronomy have their reasonings and speculations as to the prevalence of such conditions. Here, however, both records become dim and obscure, though it is evident that both point in the same direction, and combine those aqueous and igneous origins which in the last century afforded so fertile ground of one-sided dispute.

6. Both records concur in maintaining what is usually termed the doctrine of existing causes in geology. Scripture and geology alike show that since the beginning of the fifth day, or Palaeozoic period, the inorganic world has continued under the dominion of the same causes that now regulate its changes and processes. The sacred narrative gives no hint of any creative interposition in this department, after the fourth day; and geology assures us that all the rocks with which it is acquainted, have been produced by the same causes that are now throwing down detritus in the bottom of the waters, or bringing up volcanic pro-

ducts from the interior of the earth. This grand generalization, therefore, first worked out in modern times by Sir Charles Lyell, from a laborious collection of the changes occurring in the present state of the world, was, as a doctrine of divine revelation, announced more than three thousand years ago by the Hebrew law-giver ; not for scientific purposes, but as a part of the theology of the Hebrew monotheism.

7. Both records agree in assuring us that death prevailed in the world ever since animals were introduced. The punishment threatened to Adam, and considerations connected with man's state of innocence, have led to the belief that the Bible teaches that the lower animals, as well as man, were exempt from death before the fall. When, however, we find the great *tanninim* or crocodilian reptiles, created in the fifth day, and beasts of prey on the sixth, we need entertain no doubt on the subject, in so far as scripture is concerned. The geological record is equally explicit. Carnivorous creatures, with the most formidable powers of destruction, have left their remains in all parts of the geological series; and indeed, up to the introduction of man, the carnivorous fishes, reptiles and quadrupeds, were the lords and tyrants of the earth. There can be little doubt, however, that the introduction of man was the beginning of a change in this respect. A creature destitute of offensive weapons, and subsisting on fruits, was to rule by the power of intellect. As already hinted, it is probable that in Eden he was surrounded by

a group of inoffensive animals, and that those creatures which he had cause to dread, would have disappeared as he extended his dominion. In this way, the law of violent death and destruction which prevailed under the dynasties of the fish, the reptile and the carnivorous mammifer, would ultimately have been abrogated; and, under the milder sway of man, life and peace would have reigned in a manner to which our knowledge of pre-Adamite and present nature, may afford no adequate key. Be this as it may, on the important point of the original prevalence of death among the lower animals, both records are at one.

8. In the department of "final causes," as they have been termed, scripture and geology unite in affording large and interesting views. They illustrate the procedure of the All-wise Creator, during a long succession of ages, and thus enable us to see the effects of any of his laws, not only at one time, but in far distant periods. To reject the consideration of this peculiarity of geological science, would be the extremest folly, and would involve at once a misinterpretation of the geologic record, and a denial of the agency of an intelligent Designer as revealed in scripture, and indicated by the succession of beings. Many of the past changes of the earth acquire their full significance only when taken in connection with the present wants of the earth's inhabitants; and along the whole course of the geological history, the creatures that we meet with are equally rich in the evidences of nice adaptation to circumstances, and wonderful contrivances for special

ends, with their modern representatives. As an example of the former, how wonderful is the connection of the great vegetable accumulations of the ancient coal swamps, and the bands and nodules of ironstone, which were separated from the ferruginous sands or clays in their vicinity by the action of this very vegetable matter, with the whole fabric of modern civilization, and especially with the prosperity of that race which, in our time, stands in the front of the world's progress. In a very ancient period, wide swamps and deltas, teeming with vegetable life, and which if they now existed, would be but pestilent breeders of miasmata, spread over large tracts of the northern hemisphere, on which marine animals had previously accumulated thick sheets of limestone. Vast beds of vegetable matter were collected by growth in these swamps, and the waste particles that passed off in the form of organic acids, were employed in concentrating the oxide of iron in underlying clays and sands. In the lapse of ages, the whole of these accumulations were buried deep in the crust of the earth; and long periods succeeded, when the earth was tenanted by reptilian and other creatures, unconscious of the treasures beneath them. The modern period arrived. The equable climate of the coal era had passed away. Continents were prepared for the residence of man, and the edges of the old carboniferous beds were exposed by subterraneous movements, and laid bare by denudation. Man was introduced, fell from his state of innocence, and was condemned to earn his subsistence by the sweat of his

brow; and now for the first time appears the use of these buried coal swamps. They now afford at once the materials of improvement in the arts, and of comfortable subsistence in extreme climates, and subjects of surpassing interest to the naturalist. Similar instances may be gleaned by the natural theologian from nearly every part of the geological history.

Lastly,—Both records represent man as the last of God's works, and the culminating-point of the whole creation. We have already had occasion to refer to this as a result of zoology, geology and scriptural exegesis, and may here confine ourselves to the moral consequenees of this great truth. Man is the capital of the column; and, if marred and defaced by moral evil, the symmetry of the whole is to be restored, not by rejecting him altogether, like the extinct species of the ancient world, and replacing him by another, but by re-casting him in the image of his Divine Redeemer. Man, though recently introduced, is to exist eternally. He is, in one or another state of being, to be a witness of all future changes of the earth. He has before him the option of being one with his Maker, and sharing in a future glorious and finally renovated condition of our planet, or of sinking into endless degradation. Such is the great spiritual drama of man's fate, to be acted out on the theatre of the world. Every human being must play his part in it, and the present must decide what that part shall be. The Bible bases these great foreshadowings of the future, on its own peculiar evidence; yet I may ven-

ture humbly to maintain that its harmony with natural science, as far as the latter can ascend, gives to the word of God a pre-eminent claim on the attention of the naturalist. The Bible, unlike every other system of religious doctrine, fears no investigation or discussion. It courts these. "While science," says a modern divine,"* is fatal to superstition, it is fortification to a scriptural faith. The Bible is the bravest of books. Coming from God, and conscious of nothing but God's truth, it awaits the progress of knowledge with calm security. It watches the antiquary ransacking among classic ruins, and rejoices in every medal he discovers and every inscription he deciphers; for from that rusty coin, or corroded marble, it expects nothing but confirmations of its own veracity. In the unlocking of an Egyptian hieroglyphic, or the unearthing of some ancient implement, it hails the resurrection of so many witnesses; and with sparkling elation it follows the botanist as he scales Mount Lebanon, or the zoologist as he makes acquaintance with the beasts of the Syrian desert; or the traveller as he stumbles on a long-lost Petra, or Nineveh, or Babylon. And from the march of time it fears no evil, but calmly abides the fulfilment of those prophecies and the forthcoming of those events, with whose predicted story inspiration has already inscribed its page. It is not light but darkness which the Bible deprecates; and if men of piety were also men of science, and if men

* Hamilton.

of science were to search the scriptures, there would be more faith in the earth, and also more philosophy."

The reader has, I trust, found, in the preceding pages, sufficient evidence that the Bible has nothing to dread from the revelations of geology, but much to hope in the way of elucidation of its meaning and confirmation of its truth. If convinced of this, I trust that he will allow me now to ask for the warnings, promises and predictions of the Book of God, his entire confidence; and in conclusion to direct his attention to the glorious prospects which it holds forth to the human race, and to every individual of it who, in humility and self-renunciation, casts himself in faith on that Divine Redeemer, who is at once the creator of the heavens and the earth, and the brother and the friend of the penitent and the contrite. That same old book, which carries back our view to those ancient conditions of our planet, which preceded not only the creation of man, but the earliest periods of which science has cognizance, likewise carries our minds forward into the farthest depths of futurity, and shows that all present things must pass away. It reveals to us a new heaven and a new earth, which are to replace those now existing; when the Eternal Son of God, the manifestation of the Father equally in creation and redemption, shall come forth conquering and to conquer, and shall sweep away into utter extinction all the blood-stained tyrannies of the present earth, even as he has swept away the brute dynasties of the pre-Adamite world, and shall establish a

reign of peace, of love and of holiness, that shall never pass away: when the purified sons of Adam, rejoicing in immortal youth and happiness, shall be able to look back with enlarged understandings and grateful hearts, on the whole history of creation and redemption, and shall join their angelic brethren in the final and more ecstatic repetition of that hymn of praise, with which the heavenly hosts greeted the birth of our planet. May God in his mercy grant, that he who writes and they who read, may "stand in their lot at the end of the days," and enjoy the full fruition of these glorious prospects. Amen.

APPENDIX.

A.—AUTHENTICITY AND GENUINENESS OF THE MOSAIC BOOKS.

This question has been so thoroughly settled by the labours of many eminent scholars, that I have assumed in the text, the Mosaic authorship of the Pentateuch, as an undeniable fact. Still, as it is sometimes called in question by that class of erratic critics who make skepticism in all that is Biblical a necessary accompaniment of historical and ethnological research, I may shortly state one of the lines of argument followed on this subject, and which is quite sufficient to satisfy my own mind.

1. The septuagint translation proves the Pentateuch to have existed in its present form, and to have been recognized in Egypt and Palestine as genuine, about 300 years B. C., in the reign of Ptolemy I., when that translation was commenced. This, be it observed, is as far back as the time of Manetho, on whom so much reliance has been placed for early Egyptian history.

2. It was received by the Jews, on the return from Babylon, as their proper national law, and was acted on as such. Nor could it have been written or even compiled at that time, else its acceptance must have been local, and its language more modern.

3. The independent preservation of the Pentateuch by the Samaritans shows that its acceptance was not confined to the kingdom of Judah merely, and affords a distinct and disinterested evidence to its purity and authenticity.

4. The Mosaic books do not recognize the kingly constitution, and therefore could not have been a forgery of any period subsequent to the time of Samuel. Further, the Psalms, which belong to the period of David, and thence to the captivity, constantly recognize the history of the Pentateuch, its cosmogony, and its ritual, as those of the nation.

5. The above considerations carry back the antiquity of these books to the time of Samuel, say 250 years after the contemporaries of Moses. But the whole history of Samuel, as well as that of Joshua and the Judges, implies the existence of the Mosaic ritual, and the accuracy of its history. It is not possible that in the time of Samuel, or at any previous period, this connected history could have been forged or palmed on the people.

6. The books of Moses have nothing of the mythical aspect of the legends of other nations relating to the same early periods. They do narrate miracles, but these are ascribed to the direct interposition of God; and their human history is of a rational and sober character, ascribing no superhuman feats to man. They have, farther, in so far as the events stated to have occurred in the time of Moses are concerned, strong indications of being the narrative of a contemporary. For example, they detail with great accuracy many points in the manners, religion and government of Egypt, now known from the monuments to be strictly correct; but which could in ancient times have been distinctly known only to contemporaries, and these are not paraded as remarkable, but introduced artlessly and incidentally. Farther, we know from Egyptian discoveries, that the Mosaic books could have been committed to writing at the time when they were composed, and may have been directly handed down to us in that way. We have Egyptian inscriptions of a date considerably prior to that of Moses; and the Hebrew and Phenician alphabets, confessedly the oldest in the world, are manifestly derived from the phonetic hieroglyphs of Egypt. Moses was not, therefore, like some early bards in Europe, under the necessity of entrusting his compositions to oral transmission. He could leave them in a written form, and in the hands of an organized priestly body interested in preserving them.

Lastly, the pre-Mosaic history, the events of the exodus, and the provisions of the law, all harmonize with each other, and coincide in so many complicated ways, that it is difficult, if not impossible, to imagine any way in which they could have been concocted at a time posterior to that of the exodus.

Nothing in ancient literature, and little even in more modern literature, can thus be more certainly ascertained to be genuine than the Pentateuch; and, in addition to the above and many other arguments which have been adduced, those who attach any value to the authority of our Saviour, as recorded by the Evangelists, have his testimony that the Jews in his time possessed "Moses and the Prophets."

It is evident that if Moses was the writer of Genesis, the "Document" hypothesis is reduced to the comparatively insignificant question,—Did Moses avail himself of any sacred lore

that may have existed in his time? Even this, however, has scarcely any ground for its support, except the general diffusion of similar views of creation; which appears to imply that this part of revelation preceded the dispersion of man. The supposed contradictions of different parts of the earlier chapters, will be seen in the text to have no existence. The few diversities of style are quite insignificant, and fully accounted for by the changing nature of the subject. The only other argument of any weight is the use of the different names Elohim and Jehovah for God. The first is his name considered as the Almighty, the Creator. The second as the Self-Existent—He who was and is and is to come—and in more especial relation to his moral government. With respect to the use of these names, a very little comparison of scripture passages assures us—1. That Elohim is specially appropriate in speaking of creation and nature. 2. That Jehovah is specially appropriate in speaking of man and of redemption. 3. This distinction is kept up in the early chapters of Genesis, but with a conjoint use of the terms in passing from the creative work to the human history. 4. In the later books, except in certain solemn and peculiar circumstances, the terms are used as synonymous.

I have not noticed, as having no practical bearing on the solution of the question as to the origin of the narrative of creation, the ingenious but fanciful theory of Hoffman, that the perfect intellect of man before the fall embraced a kind of intuitive knowledge of the facts of creation, which has formed the substratum of Genesis 1st. Kurtz, on the other hand, maintaining that it is truly a divine revelation, but older than the time of Moses, argues very ingeniously that its probable date is that of Enoch, in whose time men began to call on the "name of the Lord" in a formal and public manner—in connection, perhaps, with the first revelation made to man after the fall. (See Introd. to "History of the Old Covenant," translated by Edersheim.)

B.—RELATION OF THE HUMAN AND TERTIARY PERIODS.

That explanation of the Mosaic cosmogony which supposes that a long time elapsed between the "beginning," and that condition of the earth mentioned in verse 2nd of Genesis 1st; and that the chaos of verse 2nd immediately preceded the creation of man, raises the geological question; Was there any such chaos at the close of the tertiary and before the modern period. Geology answers in the negative, and offers most conclusive reasons. In the Pleistocene period, raised beaches and other indications show that our existing continents were gradually rising and assuming their present outlines, while the higher animals of the

land were in the main quite distinct from the present. But they were not wholly distinct. While species of Mastodon and Mammoth, for example, roamed over the northern parts of both continents, they were accompanied by the Musk Ox and some other quadrupeds that still survive, and were sheltered by forests of Norway spruce, arbor vitae, balsam poplar, and other trees that still clothe these regions. In the same period the inhabitants of the seas were almost without exception the same as at present. These statements are proved by the evidence of well explored deposits on both sides of the Atlantic. Before the commencement of the Pleistocene period, nearly the whole land of the northern hemisphere appears to have been submerged, and during or in the progress of this submergence, the great Boulder formation or Drift was deposited. But though this great submergence must have been fatal to most of the inhabitants of the land, and forms a marked separation between the newer Pliocene and Pleistocene periods, it scarcely affected the Marine invertebrates, except in their geographical distribution, and these consequently extend back into the Pliocene periods, where they become the contemporaries of quite a different creation of terrestrial mammals.

If instead of tracing life backward, we begin at the Eocene tertiaries when the first modern animals appear, we find first a few marine invertebrates that still exist; in the Miocene and Pliocene the proportion increases, and in the Pleistocene existing species of the higher animals and of terrestrial plants make their appearance in the same gradual manner. Nor is there anywhere, between the Eocene aud the modern period, any break in the chain of existence at all comparable with that which occurs between the Eocene and the preceding mesozoic formations. In short, geology testifies to the gradual introduction of existing forms, species by species, and to the similar gradual extinction of previous forms, and the modern world is connected by one unbroken chain of organic existence with those pre-adamite worlds which have passed away. Further, if we trace back existing species of animals to their origin, we first lose man, then the other Mammals, and last of all the invertebrates of the sea; so that the duration of the existence of species is parallel to that of generic and family forms in the whole geologic history, when we trace this back to what appears to be the origin of animal life.

The application of these facts to the argument respecting days of creation is obvious. It may be found stated, very clearly and with more of illustration, in Hugh Miller's lecture on the "Two Records" in the Testimony of the Rocks. Further details will be found in Lyell's Elements, and with special reference to Great Britain, in Forbes' paper on the Tertiary and Pleistocene Faunae, in the Memoirs of the Geological Survey of Great

Britain. Facts relating to Canada, where these later formations are very clearly exhibited, will be found in papers by Prof. Ramsay and the author in the Canadian Naturalist, 1857 & 1858.

I am truly sorry that the absence of a Geological chaos immediately before man, and the views given in the text as to the nature of the primeval "desolation and emptiness," remove one of the foundations on which Kurtz has chosen to rebuild the remarkable doctrine of the original association of angels with our planet, which has suggested itself to so many thinkers. It may be stated thus :—The angels were the original inhabitants of the earth as well as of other planets and perhaps of the stars also. Those inhabiting the earth fell, and the earth in consequence passed into that state designated by "tohu vabohu." From this state it was redeemed by the divine power, the fallen angels banished, and man introduced. Hence the possibility of man attaining to knowledge of evil, and hence also the enmity of fallen angels and their desire to restore their power over this world. The theological harmonies of this doctrine are not, however, affected by our dissociating it from its supposed geological relations.

C.—ORIGINAL FLUIDITY OF THE EARTH.

In the text, the original fluidity or even gaseous expansion of the materials of our planet, is assumed as most in accordance with the scriptural intimations as to its earliest state. In the popular mind, however, this doctrine has been losing ground, owing to the circumstance, that, while the rate of increase of temperature from the surface, as measured in mines and other excavations, would give the earth a solid crust not more than a hundred miles in thickness, astronomical considerations show that its solid shell, if it be not wholly solid, must be at least eight times that thickness. In connection with this, the bold but baseless speculation of Poisson, that the whole solar system may be moving through portions of space differently heated, and thus in some geological periods acquiring and in others losing heat, and also the chemical theories of volcanic action proposed by Daubeny and others,—show that there may be other ways of accounting for the phenomena.

Of the astronomical contributions to our knowledge of this obscure subject, one of the most important is the series of calculations, based on the phenomena of Precession and Nutation, by Mr. Hopkins of Cambridge. These calculations, it is true, rest on a very narrow basis, and have recently been disputed. Mr. Hopkins's general conclusion is that the "minimum thickness of the crust of the globe, consistent with the observed amount of precession, cannot be less than one-fourth of the earth's radius," in other words from 1000 to 800 miles. The

hypothetical views stated by Mr. Hopkins, in reference to the manner in which the earth reached its present state, are thus condensed by Mr. McLaren in Jameson's Edinburgh Philosophical Journal :—

"If the earth was originally fluid, it might pass to the solid state in two modes. The heat would be continually dissipated from the surface, and would therefore be greatest at the centre; and so long as the mass was fluid, the inequality of the heat would cause a constant circulation betwixt the surface and the centre. Now, if the effect of heat in preventing solidification was greater than that of pressure in promoting it, solidification would begin at the surface, where a crust would be formed, and would gradually increase in thickness, by the addition of layer after layer to its lower side. But if the effect of pressure in promoting solidification was greater than that of heat in preventing it, solidification would begin at the centre, and extend outwardly. While the process was going on, circulation would continue in the fluid part exterior to the solid nucleus. But, before the last portions became solid, a state of imperfect fluidity would arise, just sufficient to prevent circulation. The coolest particles at the surface being then no longer able to descend, a crust would be formed, from which the process of solidification would proceed far more rapidly downwards than upwards from the solid nucleus. Our globe would thus arrive at a state in which it would be composed of a solid exterior shell and a solid central nucleus, with matter in a state of fusion betwixt them."

Such, then, according to Mr. Hopkins, may be the present condition of the interior of the earth; and he further supposes that within the solid shell itself, there are in all probability large reservoirs of melted rock, forming the foci of the volcanic action of the geological periods of the earth's history.

The calculations of Mr. Hopkins have recently been discussed by Prof. Haughton of Dublin and Archdeacon Pratt of Calcutta; the former maintaining that such calculations rest on arbitrary hypotheses and are of no real value, and that the crust of the earth may be either 10 miles or 4000 in thickness :—the latter supporting Mr. Hopkins' views. Should the astronomers finally adopt the view of Prof. Haughton, then the geologists must be content to return to their own lines of investigation; and may pretty safely affirm on the evidence of the observed increase of temperature, the wide diffusion of volcanic action, the extensive lateral motions which have taken place in portions of the earth's crust, the form of the great sunken area of the Pacific, and the extensive metamorphism of the older stratified rocks, that whatever its primitive state, the solid portions of the earth known to us do rest, in whole or in part, on fluid matter, and have been in that condition throughout geological time.

Prof. T. Sterry Hunt has well explained the chemical condi-

tions of the atmosphere of a molten globe, in his paper on "Some Points in Chemical Geology" in the Proceedings of the Geological Society of London, 1859.

D.—AZOIC ROCKS.

The announcement of the certain existence of an Azoic series, underlying the lowest Silurian beds, was made by Sir R. I. Murchison, in the Proceedings of the Geological Society, April 1845, in the following terms:—

"The fossils, indeed, described by several writers, had shown that true Silurian deposits existed in Sweden and Norway, and it was therefore necessary for us to see and describe the absolute contact of the lowest sedimentary strata with the crystalline rocks of that region. We have come to the conclusion that the lowest of these beds that are fossiliferous are the exact equivalents of the lower Silurian strata of the British Isles, and that they have been formed out of and rest upon slaty and other rocks which had undergone crystallization before their particles were ground up to compose the earliest beds in which remains of organic life appear. We apply to these crystalline masses, therefore, the term *Azoic*, simply to express that while, as far as research has hitherto gone, no vestiges of living things have been found in them, so also from their nature they seem to have been formed under such accompanying conditions of intense heat and fusion, that it is hopeless to attempt to find in them traces of organization."

In the Proceedings for the same month, is a paper by Capt. Bayfield, R.N., on the junction of the Lower Silurian and metamorphosed rocks of Lower Canada and Labrador, in which he states facts of precisely the same character with those observed by Murchison in Scandinavia. In his report for 1856, on the Geology of Canada, Sir W. E. Logan confirmed, by observations in the region of the Ottawa, the conclusions of Capt. Bayfield. Sir W. E. Logan has since ascertained that there are in Canada, below the Potsdam sandstone, the oldest member of the Silurian system, *two* series of non-fossiliferous rocks. The Upper or newer of these, the *Huronian* series, consists of slates, sandstones, conglomerates, and limestone, with interstratified plutonic rocks, principally greenstone and trap. This system occurs chiefly in the north-west of Canada, on the northern shores of Lakes Huron and Superior, and belongs to a period of intense igneous action and disturbance preceding, in these localities at least, the commencement of the Palaeozoic period.

The second and lower of the two Azoic series is the *Laurentian*, extending over a wide region along the north side of the St. Lawrence valley, from Labrador to the west end of Lake Superior, and thence to an unknown distance northward and

westward, and also occupying a considerable space in northern New York. It consists of bedded crystalline rocks, principally hornblendic gneiss, felspar rock, and crystalline limestone, with dolomite. With these are associated great masses of intrusive rock; and the whole have been disturbed and contorted in a most fantastic manner. Sir Wm. Logan has carefully worked out the stratigraphical arrangements of some parts of these Laurentian districts, and has shewn that they are regularly bedded and sedimentary rocks in an altered state—conclusions which have been confirmed and illustrated by the chemical researches of Prof. Hunt. The following section, taken from the Report of the Canadian Survey for 1851, represents a small part of the thickness of these beds, and illustrates some of these points :—

	Ft.	*in.*
Pure white, highly crystalline, coarse-grained limestone, with small disseminated scales of graphite running in layers, and rounded grains of mica, ...	5	0
An aggregate of colourless translucent quartz, containing cleavable forms of white feldspar, readily decomposing by the action of the weather into kaolin, with patches of greenish chloritic limestone containing brown mica: in some parts the feldspar is replaced by a soft greenish-white sub-translucent unctuous mineral, having a somewhat columnar structure, and a waxy lustre resembling indurated talc; and there are present occasional scales of graphite, and grains of copper pyrites decomposing into the blue carbonate, ...	0	4
A fine grained and more calcareous aggregate of quartz, with cleavable forms of feldspar and calc-spar, and scales of graphite; green stains occur in patches, ..	0	2
Coarse conglomerate, of which the matrix is a fine grained quartzose sandstone, somewhat calcareous, and still containing white feldspar, which occurs in the forms of grains and pebbles, associated with well defined large and small pebbles of vitreous, milk-blue, translucent and sometimes opalescent quartz. There are pebbles of fine grained homogeneous greyish sandstone more calcareous than the matrix; some similar to these, but nearly white and more pulverulent, afford to chemical tests a small quantity of phosphate of lime, and others of yellowish grey sandstone are finely but distinctly laminated, the laminæ being shewn by intervening bands of a white color; one of the laminated pebbles is characterised by a layer of coarser pebbles in one of the divisions. The sandstone pebbles are flat, and lie on their flat sides in		

the general plane of the stratification. Mica is disseminated in considerable abundance, and there are a few scales of graphite,.....	1	6
Fine grained calcareous sandstone,.....	0	2
Fine grained, very hard, crystalline, arenaceous bluish-grey limestone, weathering reddish, with a few scales of graphite, ...	0	4
Pure white, highly crystalline, coarse grained limestone with scales of graphite in some abundance, and rounded grains of mica, besides small grains of amber colored chondrodite rnnning in layers,.....	6	0
	13	6

These rocks, in so far as known, are destitute of well characterised fossils; but the officers of the Survey have recently found in one of the limestones, bodies resembling corals, and which may be organic; and the occurrence of carbonaceous matter in the form of graphite and of crystalline phosphate of lime, affords a strong presumption that they have contained organic matters. They may, therefore, ultimately prove to be no older than the dawn of animal or plant life on our planet. However this may be, the occurrence of pebbles of sandstone in these beds shows that when they were formed there were shores or shoals on which pebbles were rounded, and that these shores or shoals were in part formed of sedimentary rocks which must themselves have been a product of the waste of still older masses. These Laurentian rocks thus carry us back two whole periods before the formation of the beds that contain the earliest known animal remains. Further details on this subject will be found in the Reports of the Canadian Survey for 1853–6.

E.—ANCIENT FLORAS.

The most ancient land-flora of which we know anything with certainty, is that of the Devonian period. The Primordial zone or Cambrian system, and the Silurian system, though rich in marine animals, have as yet afforded no well-characterized land-plants. The Devonian flora contains some of the higher Cryptogams, representing two of the three leading families now existing, the Ferns and Lycopodiaceæ, *e.g.*, *Sphenopteris*, *Neuropteris*, *Lepidodendron*, *Knorria*, *Psilophyton*. The gymnosperms are represented by the Coniferous genera *Dadoxylon*, *Prototaxites*, *Aporoxylon;* and by the Cycadoid genera *Sigillaria*, *Calamites;* but the Sigillareæ and Coniferæ are rare. There is also a genus of uncertain affinities, probably Cryptogamous—*Noeggerathia*. (See Goeppert's Transition Flora; Unger in

Vienna Transactions, 1856; Dawson on Devonian Plants of Canada, Proc. Geol. Socy., 1859.)

In the succeeding carboniferous period, we have a great development of Cryptogams and Gymnosperms in species and genera, and possibly a few Endogens. Notwithstanding the great number of carboniferous species known, there is still no representation of the highest (Exogenous) plants and trees. This accounts for, and almost necessarily implies, the want of the higher land-animals.

With respect to the time required for the accumulation of the coal measures, and the mode of formation of coal, I may refer to the account of the section of the South Joggins in "Acadian Geology," and in Proc. Geol. Socy. of London, 1853, and to my paper on "The Structures in Coal," Proc. Geol. Socy. for 1859.

F.—DEVELOPMENT OF SPECIFIC FORMS BY NATURAL LAW.

The mysterious question of the origin of species, still continues to be agitated; though it is still true that we have no certain evidence either that any organized structure can originate, under any natural law, from dead matter, or that any species can by any possibility give origin to another. All that we can hope to reach, either by geological or zoological investigation of this subject, is probably some more clear conception of the manner and order of introduction of species.

On this subject, geology appears to give a decided negative to the gradual development of higher from lower forms; the law being rather the appearance of every type in its highest perfection, and a development by the introduction of new types, or modifications of types. Sir Charles Lyell, in his anniversary address quoted in the text, gives a very clear summary of the geological evidence on this subject, which still holds good, and has even been strengthened by facts more recently acquired:—

"Before I go into details, whether of fact or argument, on this question, I shall proceed, for the sake of enabling you the more readily to follow my train of reasoning, to make a brief preliminary statement of the principal points which I expect to establish in opposition to the theory of successive development.

"First, in regard to fossil plants, it is natural that those less developed tribes which inhabit salt water, should be the oldest yet known in a fossil state, because the lowest strata which we have hitherto found, happen to be marine, although the contemporaneous Silurian land may very probably have been inhabited by plants more highly organized.

"Secondly, the most ancient terrestrial flora with which we can be said to have any real acquaintance (the carboniferous)

contains Coniferæ, which are by no means of the lowest grade in the phænogamous class, and, according to many botanists of high authority, Palms, which are as highly organized as any members of the vegetable creation.

"Thirdly, in the secondary formations, from the triassic to the Purbeck inclusive, gymnosperms allied to Zamia and Cycas predominate; but with these are associated some monocotyledons or endogens, of species inferior to no phænogamous plants in the perfection or complexity of their organs.

"Fourthly, in the strata from the cretaceous to the uppermost tertiary inclusive, all the principal classes of living plants occur, including the dicotyledonous angiosperms of Brongniart. During this vast lapse of time four or five complete changes of species took place, yet no step whatever was made in advance at any one of these periods by the addition of more highly organized plants.

"Fifthly, in regard to the animal kingdom, the lowest Silurian strata contain highly developed representatives of the three great divisions of radiata, articulata, and mollusca, showing that the marine invertebrate animals were as perfect then as in the existing seas. They also comprise some indications of fish, the scarcity of which in a fossil state, as well as the absence of cetacea, does not appear inexplicable in the present imperfect state of our investigations, when we consider the corresponding rarity and sometimes the absence of the like remains observed in dredging the beds of existing seas.

"Sixthly, the upper Silurian group contains amongst its fossil fish cestraciont sharks, than which no ichthyic type is more elevated.

"Seventhly, in the carboniferous fauna there have been recently discovered several skeletons of reptiles of by no means a low or simple organization, and in the Permian there are saurians of as high a grade as any now existing; while the absence of terrestrial mammalia in the palæozoic rocks generally, may admit of the same explanation as our ignorance of most of the insects and all the pulmoniferous mollusca, as well as of Helices and other land-shells of the same era.*

"Eighthly, the fish and reptiles of the secondary rocks are as fully developed in their organization as those now living. The birds are represented by numerous foot-prints and coprolites in the Trias of New England, and by a few bones not yet generically determined, from Stonesfield and the English Wealden.

"Ninthly, the land quadrupeds of the secondary period are limited to two genera, occurring in the inferior oolite of Stones-

* A single land shell was found by Sir Charles and the writer in the succeeding summer, in the coal measures of Nova Scotia; and is still the only Palæozoic pulmonate known.

field; the cetacea by one specimen from the Kimmeridge clay, the true position of which requires further inquiry, while an indication of another is afforded by a cetacean parasite in the chalk. But we have yet to learn whether in the secondary periods there was really a scarcity of mammalia,* (such as may have arisen from an extraordinary predominance of reptiles, aquatic and terrestrial, discharging the same functions,) or whether it be simply apparent and referable to the small progress made as yet in collecting the remains of the inhabitants of the land and rivers, since we have hitherto discovered but few freshwater, and no land mollusca in rocks of the same age.

"Tenthly, in regard to the palæontology of the tertiary periods, there seems every reason to believe that the orders of the mammalia were as well represented as now, and by species as highly organized; whether we turn to the Lower, or to the Middle, or to the Upper Eocene periods, or to the Miocene or Pliocene; so that during five or more changes, in this the highest class of vertebrata, not a single step was made in advance, tending to fill up the chasm which separates the most highly gifted of the inferior animals and man.

"Eleventhly, the geological proofs that the human species was created after the zoological changes above enumerated are very strong. It even appears that man came later upon the earth than the larger proportion of animals and plants which are now his contemporaries. Yet, for reasons above stated, had the date of his origin been earlier by several periods, the event would have constituted neither a greater nor a less innovation, on the previously established state of the animate world. In other words, there are no palæontological grounds for believing that the mammiferous fauna after being slowly developed for ages had just reached its culminating point, and made its nearest approach in organization, instinct, and other attributes, to the human type, when the progressive intellect and the rational and moral nature of man became for the first time connected with the terrestrial system."

Pictet, in his "Traite de Palæontologie"—the most valuable work on the general natural history of fossil animals that we possess—enters fully into this subject, and states the following conclusions under his fifth law, that "The faunas of the most ancient formations are made up of the less perfectly organized animals, and the degree of perfection increases as we approach the more recent epochs"†:—

"The succession of organic beings is explained by some theorists by the *transformation of species*, assuming that the animals of the ancient formations have become modified by the influence of atmospheric and climatal changes, &c., which the

* Several other species have since been discovered.
† Translated in Jour. of Geol. Socy., vol. 7.

globe has undergone, so that the original forms have insensibly become metamorphosed into others, of which the different strata have preserved and handed down the indications, and these forms have at length by successive changes attained their present condition.

"The other theory supposes a complete destruction of all the species by each catastrophe which has terminated an epoch, and a new creation at the dawn of the next succeeding epoch.

"The theory of the transformation of species seems to me totally inadmissible, and diametrically opposed to everything that we learn from the study of zoology and physiology. This theory connects itself, as I have before observed, with the idea of a scale of beings, and that of the gradual advance towards perfection in the succession of geological periods. This indeed is the bond of union, and the completion and the explanation of such an idea, giving it the consistency of a system. The naturalists who have adopted some of these views are naturally led to accept the others, and the same reasons which I have already adduced, and which lead me to deny generally and absolutely the existence of a scale of beings and the gradual advance to perfection of successive geological faunas, also oblige me to reject the notion of the transmutation of species as accounting for the succession of organized beings on the surface of the globe.

"In conducting this argument, it is necessary to point out how little reason there is for assuming that the powers of nature were at an earlier period of the earth's history very different from what they are now. The same general laws which now govern the world have probably been in action ever since its creation, and it is impossible to admit any essential difference in their nature. The most that we are at liberty to do is to conjecture that the limits of action of each may have been somewhat more extended,—that the temperature, for instance, may have been higher, and the aqueous deposits more abundant and rapid; but the influence of these agents on organization must have been analogous to that which under similar circumstances would be exercised at present.

"The study of the fossils of the more ancient rocks exhibits similar organization to that of existing species, and there is nothing from which we can safely conclude that the temperature was very different, or that the constitution of the atmosphere varied. To admit, therefore, any modifications in organization produced by external agency, seems to me the needless introduction of a ground of uncertainty, and the phrases so often made use of with reference to the youthful vigour and the more energetic forces of nature at an earlier period should, I think, be avoided, as representing false, exaggerated, or indefinite views.

"If, then, assuming a sounder basis, we endeavour to deduce the unknown from the known,—that is, to apply to the earlier period of the earth's history what we have learnt with regard to existing nature,—we shall arrive at the following conclusions:

"All the observations and researches of any value agree in proclaiming the permanence of species at the present day. The thirty centuries which have passed away since the Egyptians embalmed the carcases of men and animals, have not in any way influenced the characteristic peculiarities of the races which inhabit Egypt. The crocodiles, the species of ibis and the ichneumons now living there, are identical in specific character with those which so many ages ago trod the banks of the Nile. Between the living animal and the mummy there are not only no differences in the essential organs, but there are none even in the most minute details, such as the number and shape of the scales, the dimensions of the bones, &c. And this permanency of species seems ensured to us by nature by the existence of those important regulations which prevent the mixture of distinct races, and the consequent formation of intermediate types. All physiologists are aware, that if two species are not very closely allied, they will not breed together at all; and that even if the species are very near, but not identical, they produce hybrids which are incapable of continuing their race and becoming the progenitors of a modified form or new species. Every aberration from the type in the way of crossing species is thus instantly stopped.

"True it is, indeed, that the changes and varieties introduced in domesticated species have been brought forward as an argument against this conclusion; but although such changes unquestionably take place in horses, oxen, sheep, pigs and goats, and yet more remarkably perhaps in dogs, where the form of the cranium becomes modified, yet these very facts appear to me to furnish a conclusion totally different from that which it has been attempted to draw. The individuals the most widely removed from the primitive type never present any real difference of form in the important organs. The skeleton always exhibits invariable characters, as well with regard to the number of the bones and their apophyses as to their relations with one another, while the organs of nutrition, the nervous system, and in short every distinctive peculiarity of organization is submitted to the same law. The only marked difference exists either in the absolute dimensions, a point known to be very variable, or in external peculiarities yet more fugitive; and with the exception of those modifications in the form of the cranium, which we may easily suppose to be connected with differences of instinct and to be the direct result of education, it cannot be said that any one of the domestic animals in its

most extreme varieties loses the character of the species. If therefore we find that the most energetic among external agents, —modifications of climate, of habit, of instinct and of food,— have only been able during the lapse of ages to produce some trifling change, which has not altered the type of the species, are we not, from this examination of the domestic animals, justified in believing the permanence of species rather than their transmutation?

"And this view is the more probable, since the differences between one fauna and another are very considerable; and we have not to treat of trifling modifications of a type, but rather of complete transitions, often into very remote forms. Some naturalists indeed have not shrunk from such consequences, and have asserted that the reptiles of the secondary period owe their parentage to the palæozoic fishes, and were themselves the progenitors of the tertiary mammals. Where is the physiologist who will admit such conclusions? and yet quite as much must be granted if it is attempted to deduce all the geological faunas from an original one by the simple transformation of species, and by means of a passage from one to another, without the direct intervention of a creative power acting at the commencement of each epoch.

"And if for the production of such results it is assumed, contrary to what we have supposed, that there have been great alterations of temperature, and changes in the constitution of the atmosphere, or that nature in her early youth was more vigorous, the laws of physiology are not less violated. Such extreme changes in the external agents might well have *destroyed* the species, and they very probably would have done so, but they could hardly modify them in any essential point.

"It seems therefore to me impossible that we should admit as an explanation of the phænomenon of successive faunas the passage of species into one another. The limits of such transitions of species, even supposing that the lapse of a vast period of time may have given them a character of reality much greater than that which the study of existing nature leads us to suppose, are still infinitely within those differences which distinguish two successive faunas.

"And lastly, one can least of all account by this theory for the appearance of new types, to explain the introduction of which we must necessarily, in the present state of science, recur to the idea of distinct creations posterior to the first.

"The theory of *successive creations* is the only one that remains; and although it is, like the rest, opposed by very weighty objections, I am not aware of any good argument directly impugning it; and I believe that in the present condition of our knowledge it is the only theory admissible, although I am bound to add that it is by no means completely satisfac-

tory, since it does not seem to me to account sufficiently for all the facts, and perhaps it is at best only provisionary. It explains well the differences which exist between successive faunas, but there are also resemblances between these faunas for which it offers no explanation.

"In order to illustrate the unsatisfactory nature of this theory, we have only to compare two successive creations of the same epoch, as for instance two faunas of the cretaceous period. In such a comparison, no one could fail to be struck by the intimate relation that exists among them, since most of the genera would be found the same, while a large number of the species are so nearly allied that they might easily be mistaken for one another. In other words, two successive faunas often have the same physiognomical aspect; and in the case just mentioned, if we compare the *turonian* with the *albian* fossils (those of the upper chalk with the species from the uppermost greensand), we shall readily find close resemblances. Is it probable that the earlier fauna had been completely annihilated, and then, by a new and independent act of creation, replaced by another fauna altogether new and yet so much resembling it? Surely there must be something which has still escaped observation; but I must repeat, that the somewhat vague objections thus suggested are in no way to be compared to those more definite ones which militate against the other theories.

"These facts also influence the manner in which we regard the existing creation. Do all animals appear exactly as they issued from the hands of the Creator, or have only a certain number of types been introduced, whence the others were derived? It seems to me difficult to admit that each one of those innumerable species, of the accurate determination of which we are so often in doubt, was in all its characters of detail a distinct and separate act of creation.

"To these questions, however, Palæontology is able to answer only in a very insufficient manner. The succession of organized beings, the origin of existing species and their geographical distribution, the formation of the different families of mankind, all these are but different aspects of the same great problem, a solution of which on any one point would necessarily throw great light upon the others.

"I believe, then, that the theory of successive creation, which is the least objectionable of all, is true in a general sense, but that other causes have perhaps combined with it to determine the actual state of existing creation and of earlier faunas. Possibly those modifications of species, which, as I have already shown, cannot explain the introduction of new types and the appearance of very distinct species, have still had some share in producing a number of allied species from a common type;

or in other words, perhaps we must in this, as in other questions, not expect a too high exclusive explanation, but admit the intervention of various causes.

"I do not, however, believe that our science is at present in a condition to give a satisfactory solution of these difficulties; and though we may with greater or less distinctness foresee such a solution, it cannot yet be demonstrated. A strict and intelligent study of nature is required, in order to bring together the various materials. We must know better than we do now each one of the successive creations, in order to form a complete idea of their mutual relations, and of their differences from those which have preceded and followed them. This is the most important problem of Palæontology, and its solution is only to be found in the observation of facts, for they alone are permanent, and they perhaps will outlive all the theories discussed at the present day."

What may be regarded as a physical hypothesis of the creation of species, has been maintained by Prof. Powell, in his essay on the "Philosophy of Creation." It is thus criticised by Mr. Hamilton, in his anniversary address as President of the Geological Society:—

"Before concluding these observations, which, however imperfect they may be, have nevertheless, I fear, greatly exceeded the usual space allotted to these Addresses, I am desirous of saying a few words on a subject closely connected with the highest considerations of our science, and which has been argued with great ability by one of the most philosophical writers of the day. I allude to the Essay of Prof. Baden Powell on the Philosophy of Creation. One of the many great and transcendental questions discussed in this Essay is the controversy as to whether we are to give a preference to the old doctrine of the immutability of species, or to the more recently introduced theory of transmutation. The question is undoubtedly one of great difficulty, but it is not the less necessary that we should endeavour to form a definite opinion on the subject, founded on the fullest and most authentic information we can obtain. It may indeed, in some respects, be said to be one of the most important questions in geological investigation. Why do we endeavour to obtain correct information respecting the true order and arrangement of stratification? Why do we endeavour to obtain the most perfect collections of the organic remains of each stratum and formation, and to ascertain the different classes and groups of organized beings which have dwelt and flourished on the surface of the globe at the different periods of its existence? Surely not for the sake of such collections and such knowledge of stratification *per se*. For, although, owing to peculiar circumstances, many geologists may not have the opportunity of carrying their investigations

beyond these points, it should never be forgotten that all such information is but a stepping-stone to higher generalizations. It is but the alphabet of one of the languages in which Nature speaks to us, and by means of which we must endeavour to unravel the past history of our globe, and to form some idea, so far as our finite faculties permit us, of the first origin, and inductively of the final objects, of creation. In this point of view, the question as to the immutability or transmutation of species is one which touches the very existence of our science, and I am therefore desirous of briefly pointing out what appears to be a fallacy in some of the statements of Prof. Powell on this subject.

"The arguments of the various writers on both sides are fully and fairly given in this work, and the author professes merely to point out the bearings of the question, the difficulties in which it is involved, and to controvert what he considers hasty and untenable assertions on either side. But while doing this, it is impossible to avoid the conviction that he has a decided bias to one side, that he considers the doctrine of transmutation of species more consistent with sound philosophical induction than what he calls the hypothesis of an eternal immutability. I shall not pretend to occupy your time by going through arguments so well known to every palæontologist and geologist. I only wish, as I said before, to point out one or two conclusions which involve what appear to me a fallacy.

"After showing how the successive investigations of the great comparative anatomists and zoologists of the last half-century have resulted in the establishment of the doctrine of the unity of composition of animal forms, a result to which the researches of Prof. Owen have mainly contributed, he proceeds to the examination of the question of species. He points out the existence of sub-species and varieties, many of which become permanent, and alludes to the number of *new* species constantly discovered which have to be inserted between other allied species already known, inferring that the specific differences between each must by such additions tend to diminish continually, and that all species tend to be connected by more and more close affinities. Thus, he argues, all differences gradually disappear, and there results no greater difference between two allied species than between varieties of the same species, and consequently no difficulty in admitting that the difference which does exist is not greater than what might be expected as the result of local circumstances, modifying external forms, and thus practically producing transmutation. Indeed he goes still further, and adopting an infinite duration of time, and an infinite number of species, he argues that there will ultimately be no perceptible difference at all between two allied species. The following is his argument:—

"'But, while the number of species thus tends to become infinitely great, the extreme difference between man (let us suppose) at one end and a zoophyte at the other end of the scale is constantly finite; hence the average difference between any two species tends to become *infinitely* small; multiplied by the number of species, it must still be equal to a *finite* quantity; and the product being *finite* if the first factor be *infinity*, the second must be *zero*.'"

"This argument appears to involve a fallacy. If this infinite number of allied species is to prove the transmutation of one form into another by showing that the difference between them is infinitely small, it would be necessary to prove either that they had all existed contemporaneously together, or that the allied forms immediately succeeded each other. But when the author calls in the aid of long geological epochs, in which some of these closely allied forms existed at long intervening periods, I cannot see how the question of transmutation is thereby strengthened. If A, B, and C are the allied forms, and A and C existed either together or in immediately succeeding periods, and B, which is the connecting link between them, is only found to exist after many millions of years, or even only after the other two had died out, the theory of transmutation cannot be supported by assuming the gradual change of A into C, through the intervening form of B. If every possible gradation of form existed in the fauna of one period and of one region, or of successive periods and neighbouring regions, then indeed the advocates of the transmutation theory might endeavour to maintain that all these forms were only varieties of one type occasioned by the peculiar conditions of life in which each was placed; but this conclusion is no longer valid when long periods have intervened between the existence of one form and that of the other. The utmost argument that could be drawn from such premises would be a confirmation of the great doctrine of unity of plan in the creation of all organized life, extending through all ages of the world.

"Another fallacy may, I think, be detected in the manner in which Prof. Powell, after stating the arguments on both sides, points out the real alternative. He says, 'The only question is as to the sense in which such *change* of species is to be understood; whether individuals naturally produced from parents were modified by successive variations of parts in any stage of early growth or rudimental development, until in one or more generations the whole species became in fact a different one; or whether we are to believe that the *whole race* perished without reproducing itself, while, independent of it, *another new race*, or other new individuals (by whatever means) came into existence, of a nature closely allied to the last, and differing often by the slightest shades, yet unconnected with them by descent;

whether there was a propagation of the same *principle of vitality* (in whatever germ it may be imagined to have been conveyed), or whether a new principle or germ originated independently of any preceding, *out of its existing inorganic elements.*'

"In the sentence which I have just quoted, there are two sets of alternatives, and I think that in each set the author has inserted a fallacy in stating the second alternative respecting the theory of immutability. In the first set he has assumed, without any warrant, that a whole former race has perished and is succeeded by another of a closely allied nature and often differing only by the slightest shades. In such a case, viz., where the difference is very slight, it may be possible that the second race is really the descendant of that previously existing, slightly modified by the external conditions of life in which it was placed. But the author has omitted all reference to those species which occur in the new or upper formations, whose resemblances or analogies to those of the preceding period are very distant or imperfect, and which cannot therefore be looked upon as the descendants or modifications of the pre-existing forms. There are undoubtedly species which have been continued through many geological periods, have survived many local disturbances, and which, while others may have perished, have been kept alive by greater vital energies or other influences, and have become the associates of new forms introduced for the first time and having no resemblance to or analogy with the forms which had preceded them. We know that some species pass into many varieties, sometimes even contemporaneously with the existence of the typical form; there is, therefore, surely nothing inconsistent with the theory of immutability in supposing, under peculiar circumstances, that varieties of some species may also take the place in a subsequent period of the original typical form. This, however, is the exception, and not the rule.

"With regard to the second set of alternatives in the passage I have quoted, I think Prof. Powell is too much begging the question when he concludes the sentence with these words: 'out of the existing inorganic elements.' Surely this is taking too physical or material a view of the matter, and one not required by those principles of inductive philosophy which he so strongly supports. The advocates of immutability of species do not generally talk of a principle of vitality originating out of inorganic elements. When old forms die out, and are succeeded by new, the *matter* of which the new consist is derived from the existing inorganic elements; but the life or principle of vitality by which it is animated must proceed from a different source, from that same source, mysterious it may be, which first breathed life into those creatures which dwelt in the earliest palæozoic ages. Organic life on this earth must have had a beginning,

and that beginning must have proceeded from a source very different from that dead matter which formed the visible body; and from that same source proceeded the principle of vitality which animated the new forms when successively created on the earth. And with reference to this question, I must emphatically deny the right assumed by Prof. Powell, when he puts what he calls an imaginary case of a truly new species making its appearance, to question those who deny the theory of transmutation, how this new species made its appearance; whether it appeared as an ovum or seed, or at what period of growth, &c. When Prof. Powell can state in what form the first living organisms appeared on the earth s surface, he may demand an answer to this question. It is the more remarkable that Prof. Powell should make this demand, as he has stated, in a former part of the Essay, that in a geological point of view the term 'Creation' signifies the fact of origination of a particular form of animal or vegetable life, without implying anything as to the precise mode of such origination: not that I think this definition altogether satisfactory, but yet it might have precluded him from making such a demand.

"But I have been led into a longer statement than I had intended. I will merely add that, notwithstanding these criticisms that I have ventured on, the essays of Prof. Powell deserve a careful and attentive reading. They are eminently suggestive and replete with deep thoughts and scientific views, and form an interesting element of the geological, or rather geognostic, literature of the day."

Agassiz also combats this view in his "Contributions to the Natural History of America," vol. 1, showing that its author has quite misapprehended the nature of organic existence and the order of its introduction. Perhaps, in consequence of these and other criticisms, Prof. Powell in his last series of Essays on the Order of Nature, is a little less confident in the assertion of his views, though he still characterizes successive acts of creation as casual suspensions or interruptions of the order of nature; as if law and order were themselves anything other than the more constant operations of the same power supposed to act at rarer intervals, though probably with equal regularity, in the introduction of species. Such misconceptions are, however, inseparable from the peculiarly shallow view which this writer and others of his school take both of nature and revelation; compressing the former within the bounds of merely physical law, lopping off the Old Testament from the latter, and overlooking altogether the higher unity which binds both together as emanations of the same Almighty mind.

In the concluding lecture of a course on the Fossil Mammals, Prof. Owen has given utterance to some valuable and suggestive hints, which I give as reported in the London Athenæum. They

show that, though not fully awake to all the relations of the subject, this great comparative anatomist tends toward broad and enlightened views of it:—

"As to the successions, or coming in, of new species, one might speculate on the gradual modifiability of the individual; on the tendency of certain varieties to survive local changes, and thus progressively diverge from an older type; on the production and fertility of monstrous offspring; on the possibility, *e.g.*, of an auk being occasionally hatched with a somewhat longer winglet, and a dwarfed stature; on the probability of such a variety better adapting itself to the changing climate or other conditions than the old type—of such an origin of *Alca torda*, *e.g.*;—but to what purpose? Past experience of the chance aims of human fancy, unchecked and unguided by observed facts, shows how widely they have ever glanced away from the golden centre of truth.

"Upon the sum of the evidence, which, in the present course, I have had the honour to submit to you, I have affirmed that the successive extinction of Amphitheria, Spalacotheria, Triconodons, and other mesozoic forms of mammals, has been followed by the introduction of much more numerous, varied, and higher-organized forms of the class, during the tertiary periods. There are, however, geologists who maintain that this is an assumption, based upon a partial knowledge of the facts. Mere negative evidence, they allege, can never satisfactorily establish the proposition that the mammalian class is of late introduction, nor prevent the conjecture that it may have been as richly represented in secondary as in tertiary times, could we but get evidence of the terrestrial fauna of the oolitic continent. To this objection I have to reply: in the palæozoic strata, which, from their extent and depth, indicate, in the earth's existence as a seat of organic life, a period as prolonged as that which has followed their deposition, no trace of mammals has been observed. It may be conceded that, were mammals peculiar to dry land, such negative evidence would weigh little in producing conviction of their non-existence during the Silurian and Devonian æons, because the explored parts of such strata have been deposited from an ocean, and the chance of finding a terrestrial and air-breathing creature's remains in oceanic deposits is very remote. But, in the present state of the warm-blooded, air-breathing, viviparous class, no genera and species are represented by such numerous and widely-dispersed individuals, as those of the order Cetacea, which, under the guise of fishes, dwell, and can only live, in the ocean. In all Cetacea the skeleton is well ossified, and the vertebræ are very numerous: the smallest cetaceans would be deemed large amongst land mammals, the largest surpass any creatures of which we have yet gained cognizance: the hugest ichthyosaur,

iguanodon, megalosaur, mammoth, or megathere, is a dwarf in comparison with the modern whale of a hundred feet in length. During the period in which we have proof that Cetacea have existed, the evidence in the shape of bones and teeth, which latter enduring characteristics in most of the species are peculiar for their great number in the same individual, must have been abundantly deposited at the bottom of the sea; and as cachalots, grampuses, dolphins, and porpoises are seen gambolling in shoals in deep oceans, far from land, their remains will form the most characteristic evidences of vertebrate life in the strata now in course of formation at the bottom of such oceans. Accordingly, it consists with the known characteristics of the cetacean class to find the marine deposits which fell from seas tenanted, as now, with vertebrates of that high grade, containing the fossil evidences of the order in vast abundance. The red crag of our eastern counties contains petrified fragments of the skeletons and teeth of various Cetacea, in such quantities as to constitute a great part of that source of phosphate of lime for which the red crag is worked for the manufacture of artificial manure. The scanty evidence of Cetacea in cretaceous beds seems to indicate a similar period for their beginning as for the soft-scaled cycloid and ctenoid fishes which have superseded the ganoid orders of mesozoic times.

"We cannot doubt but that had the genera Icthyosaurus, Pliosaurus, or Plesiosaurus, been represented by species in the same ocean that was tempested by the Balæonodons and Dioplodons of the miocene age, the bones and teeth of those marine reptiles would have testified to their existence as abundantly as they do at a previous epoch in the earth's history. But no fossil relic of an enaliosaur has been found in tertiary strata, and no living enaliosaur has been detected in the present seas; and they are consequently held by competent naturalists to be extinct. In like manner does such negative evidence weigh with me in proof of the non-existence of marine mammals in the liassic and oolitic times. In the marine deposits of those secondary or mesozoic epochs, the evidence of vertebrates governing the ocean, and preying on inferior marine vertebrates, is as abundant as that of air-breathing vertebrates in the tertiary strata; but in the one the fossils are exclusively of the cold-blooded reptilian class, in the other of the warm-blooded mammalian class. The Enaliosauria, Cetiosauria, and Crocodilia, played the same part and fulfilled similar offices in the seas from which the lias and oolites were precipitated, as the Delphinidæ and Balænidæ did in the tertiary, and still do in the present seas. The unbiassed conclusion from both negative and positive evidence in this matter is, that the Cetacea succeeded and superseded the Enaliosauria. To the mind that will not accept such conclusions, the stratified oolitic rocks must

cease to be monuments or trustworthy records of the condition of life on the earth at that period. So far, however, as any general conclusion can be deduced from the large sum of evidence above referred to, and contrasted, it is against the doctrine of the Uniformitarians. Organic remains, traced from their earliest known graves, are succeeded, one series by another, to the present period, and never re-appear when once lost sight of the ascending search. As well might we expect a living Ichthyosaur in the Pacific, as a fossil whale in the Lias: the rule governs as strongly in the retrospect as the prospect. And not only as respects the Vertebrata, but the sum of the animal species at each geological period has been distinct and peculiar to such period. Not that the extinction of such forms or species was sudden or simultaneous: the evidences so interpreted have been but local: over the wider field of life, at any given epoch, the change has been gradual; and, as it would seem, obedient to some general, but as yet, ill-comprehended law. In regard to animal life, and its assigned work on this planet, there has, however, plainly been an ascent and progress in the main.

"Although the Mammalia, in regard to the plenary development of the characteristic orders, belong to the Tertiary division of geological time, just as 'Echini are most common in the superior strata; Ammonites in those beneath, and Producti with numerous Encrini, in the lowest' of the secondary strata, yet the beginnings of the class manifest themselves in the formations of the earlier preceding division of geological time. No one, save a prepossessed Uniformitarian, would infer from the Lucina of the permian, and the Opis of the trias, that the Lamellibranchiate Mollusks existed in the same rich variety of development at these periods as during the tertiary and present times; and no prepossession can close the eyes to the fact that the Lamellibranchiate have superseded the Palliobranchiate bivalves.

"On negative evidence Orthisina, Theca, Producta, or Spirifer are believed not to exist in the present seas: neither are the existing genera of siphonated bivalves and univalves deemed to have abounded in permian, triassic, or oolitic times. To suspect that they may have then existed, but have hitherto escaped observation, because certain Lamellibranchs with an open mantle, and some holostomatous and asiphonate Gasteropods, have left their remains in secondary strata, is not more reasonable, as it seems to me, than to conclude that the proportion of mammalian life may have been as great in secondary as in tertiary strata, because a few small forms of the lowest orders have made their appearance in triassic and oolitic beds.

"Turning from a retrospect into past time to the prospect of time to come,—and I have received more than one inquiry into the amount of prophetic insight imparted by Palæontology,—I

may crave indulgence for a few words, of more sound, perhaps, than significance. But the reflective mind cannot evade or resist the tendency to speculate on the future course and ultimate fate of vital phenomena in this planet. There seems to have been a time when life was not; there may, therefore, be a period when it will cease to be. Our most soaring speculations still show a kinship to our nature; we see the element of finality in so much that we have cognizance of, that it must needs mingle with our thoughts, and bias our conclusions on many things. The end of the world has been presented to man's mind under divers aspects:—as a general conflagration; as the same, preceded by a millennial exaltation of the world to a Paradisiacal state,—the abode of a higher and blessed race of intelligences. If the guide-post of Palæontology may seem to point to a course ascending to the condition of the latter speculation, it points but a very short way, and in leaving it we find ourselves in a wilderness of conjecture, where to try to advance is to find ourselves 'in wandering mazes lost.'

"With much more satisfaction do I return to the legitimate deductions from the phenomena we have had under review.

"In the survey which I have taken in the present course of lectures of the genesis, succession, geographical distribution, affinities, and osteology of the mammalian class, if I have succeeded in demonstrating the perfect adaptation of each varying form to the exigencies, and habits, and well-being of the species, I have fulfilled one object which I had in view, viz., to set forth the beneficence and intelligence of the Creative Power. If I have been able to demonstrate a uniform plan pervading the osteological structure of so many diversified animated beings, I must have enforced, were that necessary, as strong a conviction of the unity of the Creative Cause. If, in all the striking changes of form and proportion which have passed under review, we could discern only the results of minor modifications of the same few osseous elements,—surely we must be the more strikingly impressed with the wisdom and power of that Cause which could produce so much variety, and at the same time such perfect adaptations and endowments, out of means so simple. For, in what have those mechanical instruments,—the hands of the ape, the hoofs of the horse, the fins of the whale, the trowels of the mole, the wings of the bat,—so variously formed to obey the behests of volition in denizens of different elements—in what, I say, have they differed from the artificial instruments which we ourselves plan with foresight and calculation for analogous uses, save in their greater complexity, in their perfection, and in the unity and simplicity of the elements which are modified to constitute these several locomotive organs. Everywhere in organic nature we see the means not only subservient to an end, but that end accomplished by the

simplest means. Hence we are compelled to regard the Great Cause of all, not like certain philosophic ancients, as a uniform and quiescent mind, as an all-pervading *anima mundi*, but as an active and anticipating intelligence. By applying the laws of comparative anatomy to the relics of extinct races of animals contained in and characterizing the different strata of the earth's crust, and corresponding with as many epochs in the earth's history, we make an important step in advance of all preceding philosophies, and are able to demonstrate that the same pervading, active, and beneficent intelligence which manifests His power in our times, has also manifested his power in times long anterior to the records of our existence. But we likewise, by these investigations, gain a still more important truth, viz., that the phenomena of the world do not succeed each other with the mechanical sameness attributed to them in the cycles of the Epicurean philosophy; for we are able to demonstrate that the different epochs of the history of the earth were attended with corresponding changes of organic structure; and that, in all these instances of change, the organs, as far as we could comprehend their use, were exactly those best suited to the functions of the being. Hence we not only show intelligence evoking means adapted to the end; but, at successive times and periods, producing a change of mechanism adapted to a change in external conditions. Thus the highest generalizations in the science of organic bodies, like the Newtonian laws of universal matter, lead to the unequivocal conviction of a great First Cause, which is certainly not mechanical. Unfettered by narrow restrictions,—unchecked by the timid and unworthy fears of mistrustful minds, clinging, in regard to mere physical questions, to beliefs, for which the Author of all truth has been pleased to substitute knowledge,—our science becomes connected with the loftiest of moral speculations; and I know of no topic more fitting to the sentiments with which I desire to conclude the present course. If I believed—to use the language of a gifted contemporary—that the imagination, the feelings, the active intellectual powers, bearing on the business of life, and the highest capacities of our nature, were blunted and impaired by the study of physiological and palæontological phenomena, I should then regard our science as little better than a moral sepulchre, in which, like the strong man, we were burying ourselves and those around us in ruins of our own creating. But surely we must all believe too firmly in the immutable attributes of that Being, in whom all truth, of whatever kind, finds its proper resting-place, to think that the principles of physical and moral truth can ever be in lasting collision."

At the meeting of the British Association in Aberdeen (1859), Sir Charles Lyell announced a forthcoming work by Charles Darwin, in which that able zoologist will endeavour to prove

"that those powers of nature which give rise to races and permanent varieties in animals and plants, are the same as those which, in much longer periods, produce species, and, in a still longer series of ages, give rise to differences of generic rank."

It would, of course, be imprudent to criticise this work before its appearance; and we may rest assured, that, whatever the value of his conclusions, a naturalist like Darwin must add vastly to our knowledge of the facts bearing on the subject. It is quite safe, however, to assert, that he can never succeed in proving that variation and specific unity are attributable to the same cause. The continuous reproductive power implanted *in* the species, and the changes impressed on it from *without*, are, like cohesion and heat in reference to the particles of matter—opposite influences. The one may counteract or modify the other, but cannot take its place. It is easy to understand how variation, combined with geographical changes and local extinction, may so separate the members of a species as to simulate distinctness. It must also be admitted from the analogy of God's operations, that the creative acts, whatever their nature, must, as well as variability, be regulated by some law; but the law of variation cannot possibly be identical with the law of specific origin and continuation which it modifies, except in some such general sense as that in which gravitation may produce disturbances of movements which themselves are produced by gravitation. But, in such a case, it is absurd to maintain that the disturbing cause of attraction from without, can have produced the original motions. In the same manner all that we know of variability points to the conclusion that it is subordinate to specific unity, though subject to the same vital laws. Specific origin it cannot reach, though it may imitate its effects, and present analogous phases of change, illustrative of the real laws of creation of species. It is to be hoped that Mr. Darwin will not neglect this distinction, and thus vitiate the great mass of facts which he has accumulated, by grouping them around an untenable thesis.

In this connection, I may direct attention to one of the laws of variation, not perhaps sufficiently insisted on in the text. On any theory of the origin of species, these must always have originated in the physical conditions most favourable to their existence in the full integrity of their powers. This being admitted, it follows that variation is always in the direction of degeneracy, except where individuals already degenerate are induced by some new and favourable combination of circumstances to retrace the steps of their degradation. Observed facts accord with this, and show also, that, even under favourable circumstances, re-elevation is more slow and difficult than degeneracy. While, therefore, it is just conceivable that, a higher form being given, lower forms might result from its degeneracy or disintegration, it is impossible that the variation of lower forms could

result in the production of anything higher. Consequently, something beyond and higher than variability is required to account for the observed succession of species in time.

G.—THE TANNINIM.

The following synopsis of the instances of the occurrence of the words *Tannin* and *Tan* will serve to show the propriety of the meaning, "great reptiles," assigned in the text to the former, as well as to illustrate the utility in such cases of "comparing scripture with scripture":—

1. Tannin.

Ex. vii. 9.—Take thy rod and cast it before Pharaoh, and it shall become a *serpent*.	Probably a serpent, though perhaps a crocodile. (Septuagint, "δράκων.")
Deut. xxxii. 23.—Their vine is the poison of *dragons*.	Perhaps a species of serpent. (Sept., "δράκων.")
Job vii. 12.—Am I a sea or a *whale*, that thou settest a watch over me.	Michaelis and others think, probably correctly, that the Nile and the crocodile, both objects of vigilance to the Egyptians, are intended. (Septuagint, "δράκων.")
Psal. lxxiv. 14.—Thou didst divide the sea by thy strength. Thou breakest the heads of the *dragons* in the waters.	Evidently refers to the destruction of the Egyptians in the Red Sea, under emblem of the crocodile. (Septuagint, δράκων.")
Psalm xci. 13.—The young lion and the *dragon* thou shalt trample under foot.	The association shows that a powerful carnivorous animal is meant. (Sept., "δράκων.")
Psal. cxlviii. 7.—Praise the Lord ye *dragons* and all deeps.	Evidently an aquatic creature. (Sept., "δράκων.")
Is. xxvii. 1.—He shall slay the *dragon* in the midst of the sea (river.)	A large predaceous aquatic animal (the crocodile), used here as an emblem of Egypt. (Sept., "δράκων.")
Is. li. 9.—Hath cut Rahab and wounded the *dragon*.	Same as above.
Jer. li. 34.—(Nebuchadnezzar) hath swallowed me up as a *dragon*.	A large predaceous animal. (Sept., "δράκων.")
Ezekiel xxix. 3.—Pharaoh, king of Egypt, the great *dragon* that lieth in the rivers.	In the Hebrew *tanim* appears by mistake for *tannin*. This is clearly the crocodile of the Nile. Verses 4 and 5 show that it is a large aquatic animal with *scales*. (Septuagint, "δράκων.")

2. Tan.

Psalm xliv. 19.—Thou hast sore broken us in the place of *dragons*.	Some understand this of shipwreck; but, more probably, the place of dragons is the desert. (Sept., "κάκωσις.")
Is. xxxiv. 13.—(Bozrah in Idumea) shall be a habitation of *dragons* and a court of owls (or ostriches).	An animal inhabiting ruins, and associated with the ostrich. (Sept., "σειρήν.")
Is. xliii. 20.—The wild beasts shall honour me, the *dragons* and the ostriches, because I give water in the wilderness.	Evidently an animal of the dry deserts. (Sept., "σειρήν.")
Is. xiii. 22.—*Dragons* in their pleasant palaces.	Represented as inhabiting the ruins of Babylon, and associated with wild beasts of the desert. (Sept., "ἐχῖνος.")
Is. xxxv. 7.—And the parched ground shall become a pool, and the thirsty land springs of water; in the habitation of *dragons* where each lay, shall be grass with reeds and rushes.	An animal making its lair or nest in dry, parched places. (Sept., "ὄρνις.")
Job. xxx. 29.—I am a brother of *dragons* and a companion of ostriches.	The association indicates an animal of the desert, and the context that its cry is mournful. (Sept., "σειρήν.")
Jer. ix., xi.: 10, 21.—I will make Jerusalem heaps, a den of *dragons*.	Same as above. See also Jeremiah xlix., xxxii., 51, 37, and Mal. i. 3, where the word is in the female form (*tanoth*). (Septuagint, "δράκων" and "στρουθός.")
Lam. iv. 3.—Even the *sea-monsters* draw out the breast, they give suck to their young ones. The daughter of my people is become cruel, like the ostriches in the wilderness.	In the Hebrew text the word is *Tannin* evidently an error for *Tanim*. The suckling of young, and association of ostriches, agree with this. (Sept., "δράκων.")
Micah i. 8.—I will make a wailing like the *dragons*, and mourning like the owls (ostriches).	The wailing cry accords with the view of Gesenius that the jackal is meant. (Septuagint, "δράκων.")

We learn from the above comparative view, that the tannin is an aquatic animal of large size, and predaceous, clothed with scales, and a fit emblem of the monarchies of Egypt and Assy-

ria. In two places, it is possible that some species of serpent is denoted by it. We must suppose, therefore, that in Genesis i., it denotes large crocodilian, and perhaps serpentiform, reptiles. The *Tan* is evidently a small mammal of the desert.

H.—RECENT ELEVATION OF WESTERN AND CENTRAL ASIA, AND SPECIFIC CENTRES OF CREATION.

Many recent geological discoveries in Asia, establish and confirm the views given in the text, in reference to the creation of man and the deluge.

In a paper on the Geology of the Taurus, by W. W. Smyth, Esq., in the 1st vol. of the Journal of the London Geological Society, we are informed that the igneous rocks which have given to that district its present form and elevation, belong to a late tertiary era, and that the same remark probably applies to an extensive region extending from Asia Minor and Syria into Mesopotamia.

In a paper on the Geology of the Himalaya, by Col. Strachey, in the 7th vol. of the same Journal, we find that while almost the whole of India is of comparatively recent elevation above the level of the sea, there exists in the Plain of Thibet, an extensive surface of tertiary beds, evidently of aqueous and probably of marine origin, and now at an elevation of 16,000 to 17,000 feet above the sea. The fossils of these beds show that they belong to a late tertiary period, but whether their elevation to their present great height belongs to the modern or tertiary era, we have as yet no means of judging.

In Prof. Hitchcock's "Geology of the Globe," 1853, I find it stated, on the authority of M. Dubois, that the process of elevation in the chain of the Caucasus has extended even into the recent era, and it is even suggested that such elevation may have occasioned the Noachic deluge. It is said also that another geologist finds a peculiar mud deposit in Armenia, which he suspects may have been left by the Noachian deluge. This may possibly be a continuation of the Tchornozem of Russia, a widely diffused surface bed of tertiary mud, described by Sir R. I. Murchison, and which is more recent than the pleistocene gravels of those regions. It farther appears, from Sir R. I. Murchison's explorations in Russia, that the chain of the Ural Mountains, as well as all those regions in Northern Europe and Siberia which are covered by the Northern Drift or boulder formation, must be added to the recently elevated region of Western Asia. He has shewn that in the latest tertiary period, the Urals, then a low chain, formed the western coast of a comparatively narrow belt of wooded country, extending across the southern part of Siberia, while the plains of Northern Europe and Northern Siberia were under water. If any considerable

part of these elevations, and those referred to in the preceding part of this note, occurred in the post-Adamic period, and in connection with subsidence of the Aralo-Caspian plain, we can be at no loss for the physical agencies employed by the Almighty in the extinction of the Antediluvian nations.

For the full exposition of the doctrine of centres of creation, referred to in the text, I must refer to an Essay by Prof. E. Forbes, in the first volume of the Memoirs of the Geological Survey of Great Britain. Prof. Forbes reasons on the assumption of *specific centres*, or points from which each species became diffused; each species being supposed to be composed of descendants from a single pair. On this view, every country has been peopled either—1st, by species *created* within its limits; or, 2nd, by species *transported* to it; or, 3rd, by species which have *migrated* to it. Prof. Forbes reasons at great length on the sources of the present Flora and Fauna of the British Islands, which he believes to be descended mainly from progenitors created before the Human era, but posterior to the Eocene Tertiary, and to have been derived from several sources, through the medium of continuous connecting tracts of land since submerged. Were it possible, in the present state of knowledge, to obtain a similar collection of facts in reference to the original seats of man in Asia, many difficulties in reference to the connection of geological and human history would be at once removed.

I.—PRIMITIVE UNITY OF LANGUAGE.

I may refer to the Essay of Dr. Max Muller, on Comparative Mythology, for a very clear statement of the character of the links that bind together the Indo-European languages. These affinities indicate—1. A radical identity of all these tongues. 2. That they are not derivatives one from another, but all from some primitive common source—the "Arian" stock. 3. That this ancient stock had attained considerable advancement in civilization before its dispersion. Dr. Muller does not attempt any comparison with the Semitic tongues, though many of the words which he cites as examples invite to such comparisons, and the theories on this subject referred to in the text show that such comparisons may be profitably made, though many difficulties surround the subject, especially in consequence of the very early date at which the Arian and Semitic tongues can be shown to have been distinct, and the many movements of population that have subsequently occurred. I may merely state here that the Semitic type of language has some philological claims to be regarded as more ancient and nearer to the primitive stock than the Arian. I may illustrate this by a few of the

words referred to in the able essay above cited. No terms are more constant than those which refer to the nearest family relations. Thus the Indo-European languages furnish the following table:—

	Sanscrit.	*Zend.*	*Greek.*	*Latin.*	*Gothic.*	*Slave.*	*Erse.*
Father,	Pitâr,	Patar,	πατήρ,	Pater,	Fadar,	——	Athair.
Mother,	Mâtâr,	Mâtar,	μήτηρ,	Mater,	——	Mate,	Mathair.
Daughter,	Duhitar,	Dughdhar,	θυγάτηρ,	——	Daubtar,	Dukte,	Dear.

For the roots of the two first lines of words Muller refers us to the Sancrit *Pa* to protect, and *Ma* to produce. But this is obviously fallacious, since the sounds ma, amma, pa or ba, appa, are the first articulate utterances of the infant, and have no doubt been adopted by the parents as their own names—the sense of protector and producer being secondary, and founded on the relation itself. Now, in the Semitic languages we have these words in their primary unchanged forms of *Ab*, *Abba*, *Am*, *Amma*, *Mau;* and as early as the date of Job we have *Ab* used in the secondary sense of protection. Again, the word daughter may be traced to a Sanscrit root signifying to milk, the daughter being naturally the milkmaid of the family; but it is quite certain that daughters must have been before milkmaids, so that this must be an accidental and secondary name; and it has not been introduced among the Semites, who, using the term *ben*, referring to the building up of the family, for the son, have the feminine form of the same word for the daughter. These are a few out of many instances which might be adduced to show that Semite words are more primitive than Arian words. So also is Semite grammar, which is undeveloped as to inflexions; and thus has an unchanged and primordial aspect. If we ask reasons for this, we may be referred to the fixed and stationary character of Semitic civilization in general; and with more immediate relation to this subject, to the circumstance that these languages were reduced to writing at a very early period, and thus had the conservative influence of a literature long before it existed in the Arian tongues, which have at a comparatively modern period borrowed their alphabets from the Semite nations. This view is well stated by Donaldson*:—

"The distinctive characteristics of the Semitic languages may be said to consist in the generally triliteral form of their uninflected words, and in the invariably syntactical contrivances by which the whole mechanism of speech is carried on. I seek the cause of this in the early adoption of alphabetical writing, in the establishment of a literature, and in the unusually frequent intermixture of cognate races."

* Report Brit. Association, 1851.

He then proceeds to remark that the Slavonian, one of the latest branches of the Indo-European languages to be reduced to writing, differs most widely from the Semitic tongues in grammatical structure, though not in words. In a subsequent passage he thus remarks on the Semitic alphabet:—

"The palæography of the Semitic nations lies half-way between that of the Greeks and Indians, who adopted no system of writing except the alphabetic, and did not make use of this until their poetical literature had taken root and begun to flourish; and that of the Chinese and Egyptians, who employed picture writing instead of their memories from the very earliest period, and who never attained to a perfectly abstract and simple alphabet. I believe that the first Semitic alphabet was due to the Hebrews rather than to the Phenicians. The sacred history of this nation tells us that their great legislator was educated in Egypt at a time when the phonetic hieroglyphs were in general use; and there cannot be the least doubt that the Phenician and Hebrew characters may be traced to particular signs in the Egyptian Syllabarium. Some very satisfactory specimens of this have been given by Mr. Thurleigh Wedgwood, in the Trans. Phil. Soc.; Vol. 5, No. 101. It has always appeared to me a most interesting fact, that we owe our first alphabet to the same race from which we derive the foundations of our religion. Picture writing and picture-worship are intimately connected. Abstraction is anti-idolatrous, and is manifested in the invention of an alphabet quite as much as in the adoption of a pure theism: nor would I quarrel with any one if he thought fit to ascribe to the same inspiration the commandments written on the two tables of stone, and the simple characters by which they expressed their meaning. Be this as it may, it seems pretty clear that the Hebrews never had any but an alphabetical system, if any; and it is also clear that they had no literature except that which was written down alphabetically. The same may be said of the other pure races of the Syro-Arabian family; and this alone will explain the permanence and uniformity of their syntactical structure."

The Bible itself curiously coincides with these deductions of philology. Writing is mentioned incidentally in Job, but it first appears historically in Exodus. In Joshua, however, there is mention of a "city of books" or writings—Kirjath Shephar—as existing previously in Canaan. An antiquity even Antediluvian is claimed for Semitic words, by their occurring in the names of men in that era; and the fact that the races affiliated to both Shem and Ham used in common the languages now known as Semitic, is abundantly proved by the history of the patriarchs and of Egypt. The Semitic languages were consequently those of the first great civilized communities. The Bible also is cognizant of the fact of the branching of the

Arian languages from the primitive stock, as well as of those sporadic forms of speech which appertain to rude outlying fragments of the human race everywhere; and it has a history of its own to account for them; namely, the confusion of tongues at Babel. This event, which must have occurred within two centuries of the deluge, may either have been miraculous or an ordinary interposition of Providence. In the former case, we must take the statement as it stands, and need not even trouble ourselves with the numberless conjectures which have been advanced as to its mode of occurrence. In the latter case, it becomes a part of the ordinary political history of the world, and may be read thus. Within a short time after the deluge, many families of men, scattering themselves abroad, and adopting various modes of life, began very rapidly to differ in their modes of thought and expression, and to become isolated from each other; processes which would naturally be very rapid in the case of small tribes with a slender stock of words, and constantly meeting in their wanderings with new objects, and adopting new contrivances and modes of subsistence. To arrest these changes, certain leaders attempted to collect all or most of these tribes into one civil or national organization; but the attempt only showed that the process of separation had already proceeded too far—that the plans of Divine Providence could not be averted by merely political combinations; and the race became dispersed, one portion of it to retain the primitive forms of expression, the others to modify indefinitely the construction of speech either in the direction of barbaric rudeness or of artificial complexity and polish.

K.—ANCIENT MYTHOLOGIES.

The current views respecting the relations of ancient mythologies with each other and with the Bible, have been continually shifting and oscillating between extremes. The latest and at present most popular of these extreme views, is that so well expounded by Dr. Max. Muller in the Oxford Essays, and which traces at least the Indo-European theogony to a mere personification of natural objects. The views given in the text are those which to the author appear alone compatible with the Bible, and with the relations of Semitic and Arian theology; but, as the subject is generally regarded from a quite different point of view, a little further explanation may be necessary.

1. According to the Bible, spiritual monotheism is the primitive faith of man, and with this it ranks the doctrine of a malignant spirit or being opposed to God, and of a primitive state of perfection and happiness. It is scarcely necessary to say that these doctrines may be found as sub-strata in all the ancient theologies.

2. In the Hebrew theology the fall introduces the new doctrine of a mediator or deliverer, human and divine, and an external symbolism, that of the cherubic forms, composite figures made up of parts of the man, the lion, the ox and the eagle. These forms are referred back to Eden, where they are manifestly the emblems of the perfections of the Deity, lost to man by the fall, and now opposed to his entrance into Eden and access to the tree of life, the symbol of his immortal happiness. Subsequently, the cherubim are the visible indications of the presence of God in the tabernacle and temple; and in the Apocalypse they re-appear as emblems of the Divine perfections, as reflected in the character of man redeemed. The cherubim, as guardians of the sacred tree, and of sacred places in general, appear in the worship of the Assyrians and Egyptians, as the winged lions and bulls of the former, and the sphinx of the latter. They can also be recognized in the sepulchral monuments of Greek Asia and of Etruria. Further, it was evidently an easy step to proceed from these cherubic figures to the adoration of sacred animals. But the cherubic emblems were connected with the idea of a coming Redeemer, and this was with equal ease perverted into hero-worship. Every great conqueror, inventor or reformer, was thus recognized as in some sense the "coming man," just as Eve supposed she saw him in her first-born.

3. The earliest ecclesiastical system was the patriarchal, and this also admitted of corruption into idolatry. The great patriarch, venerable by age and wisdom, when he left this earth for the spirit world, was supposed there, in the presence of God, to be the special guardian of his children on earth. The greater gods of Egypt and of Greece were obviously of this character, and in China and Polynesia we see at this day this kind of idolatry in a condition of active vitality.

4. As stated in the text, the mythology of Egypt and Greece bears evident marks of having personified certain cosmological facts akin to those of the Hebrew narrative of creation. In this way ancient idolators disposed of the pre-historic and pre-Adamite world, changing it into a period of gods and demi-gods.

5. In all rude and imaginative nations, which have lost the distinct idea of the one God, the Creator, nature becomes more or less a source of superstitions. Its grand and more rare phenomena of volcanoes, earthquakes, thunder-storms, eclipses, become supernatural portents; and as the idea of power associates itself with them, they are personified as actual agents and become gods. In like manner, the more constant and useful objects and processes of nature, become personified as beneficent deities. This may be, to a great extent, the character of the Arian theology; but, except where all ideas of primitive

religion and traditions of early history have been lost, it cannot be the whole of the religion of any people. The Bible negatively recognizes this source of idolatry, in so constantly referring all natural phenomena to the divine decree. In connection with this, it is worthy of remark, that rude man tends to venerate the new animal forms of strange lands. Something of this kind has probably led some of the American Indians to give a sort of divine honour to the bear. It was in Egypt that man first became familiar with the strange and gigantic fauna of Africa, whose effect on his mind in primitive times we may gather from the book of Job. In Egypt, consequently, there must have been a strong natural tendency to the adoration of animals.

The above origins of idolatry and mythology, as stated or implied in the Bible, of course assume that the Semite monotheistic religion is the primitive one. The first deviations from it probably originated in the family of Ham. A city of the Rephaim of Bashan was in the days of Abraham named after Ashteroth Karnaim—the two horned Astarte, a female divinity and prototype of Diana, and perhaps a historic personage, in whom both the moon and the domestic ox were rendered objects of worship. This is the earliest Bible notice of idolatry.* In Egypt a mythology of complex diversity existed at least as far back. We must remember, however, that Egypt is Cush as well as Mizraim, and its idolatry is probably to be traced, in the first instance, to the Nimrodic empire, from which, as from a common centre, certain new and irreligious ideas seem to have been propagated among all the branches of the human family. It is quite probable that the correspondences between Egyptian, Greek and Hindoo myths, go back as far as to the time when the first despotism was erected on the plain of Shinar, and when able but ungodly men set themselves to erect new political and social institutions on the ruins of all that their fathers had held sacred. In addition to this, the mythology and language of the Arians, alike bear the impress of the innovating and restless spirit of the sons of Japhet.

I have stated the above propositions to show that the Bible affords a rational and connected theory of the orig'n of the false religions of antiquity; and to suggest as inquiries in relation to every form of mythology—how much of it is primitive monotheism, how much cherub-worship, how much hero-worship, how much ancestor-worship, how much distorted cosmogony, how much pure idealism and superstition, since all these are usually present. I may be allowed further to remind the reader how much evidence we have, even in modern times, of the strong tendency of the human mind to fall into one or other of these forms of idolatry; and to ask him to reflect that really

* Except, perhaps, Job xxxi. 27.

the only effectual conservative element is that of revelation. How strong an argument is this for the necessity to man of an inspired rule of religious faith.

L.—SUPPOSED TERTIARY RACES OF MEN.

It may be anticipated that almost every year will produce supposed cases of human remains or works of art in the later tertiary deposits. There are so many causes of accidental intermixtures, and ordinary observers are so little aware of the sources of error against which it is necessary to guard, that mistakes of this kind are inevitable. Even geologists are very likely to be misled in investigations of this nature. A remarkable instance of this, in the case of the delta of the Nile, has been already noticed. Another discovery, which has lately made some noise in the scientific world, is probably referable to the same category. I refer to the supposed occurrence of implements of flint in the gravel at Abbeville in France. This was first maintained by M. Boucher de Perthes in 1849, but his statements appeared so improbable that little attention was given to them. More recently, Mr. Prestwick and Mr. Evans have brought the subject before the Royal Society and the Society of Antiquaries in England, in connection with the discovery of flint weapons with bones of extinct animals in a cave at Brixham.

Should the objects found in this case prove to be really products of art, and their position be certainly in the pleistocene drift, contemporary with the extinct Elephant, Rhinoceros, Hyæna, &c., of the west of Europe, then we might with certainty conclude—First, that the race by which these implements were made existed at a period immeasurably more ancient than any assigned even by Bunsen's new chronology, or the myths of Egypt or China, to the human species; and secondly, that this race is not at all connected with biblical or historical man, but must be an extinct species of anthropoid animal, belonging to a prior geological period. That there cannot have been any such species before man, and sufficiently intelligent to make flint weapons, I am not prepared to maintain; but I do not regard the evidence adduced as at all sufficient to establish its existence, still less to carry back the human species to a period rendered even geologically improbable by the lapse of time, and the extinction of nearly all the land-animals in the meantime. The defects in the proof, as stated at present, are of the following kinds:—

1. The implements found are not certainly artificial. They are described as follows by Mr. Evans, as reported in the *Athenæum:*

"1. Flakes of flint, apparently intended for knives or arrow-

heads. 2. Pointed implements, usually truncated at the base, and varying in length from four to nine inches—possibly used as spear or lance heads, which in shape they resemble. 3. Oval or almond-shaped implements, from two to nine inches in length, and with a cutting edge all round. They have generally one end more sharply curved than the other, and occasionally even pointed, and were possibly used as sling-stones, or as axes, cutting at either end, with a handle bound round the centre. The evidence derived from the implements of the first form is not of much weight, on account of the extreme simplicity of the implements, which at times renders it difficult to determine whether they are produced by art or by natural causes. This simplicity of form would also prevent the flint flakes made at the earliest period from being distinguishable from those of a later date. The case is different with the other two forms of implements, of which numerous specimens were exhibited; all indisputably worked by the hand of man, and not indebted for their shape to any natural configuration or peculiar fracture of the flint. They present no analogy in form to the well-known implements of the so-called Celtic or stone period, which, moreover, have for the most part some portion, if not the whole, of their surface ground or polished, and are frequently made from other stones than flint. Those from the drift are, on the contrary, never ground, and are exclusively of flint. They have, indeed, every appearance of having been fabricated by another race of men, who, from the fact that the Celtic stone weapons have been found in the superficial soil above the drift containing these ruder weapons, as well as from other considerations, must have inhabited this region of the globe at a period anterior to its so-called Celtic occupation."

The objects found are here admitted to differ from the implements of the primitive Celts, and they differ in like manner from those of the American Indians, which are almost if not quite undistinguishable from those of ancient Europe and Asia. One at least of the kinds mentioned has scarcely a semblance of artificial form, and the others are all merely fractured, not ground or polished. In so far as one can judge, without actually inspecting the specimens, these appear to be fatal defects in their claim to be weapons. The observers have evidently not taken into consideration the effects of intense frost in splitting flinty and jaspery stones. It is easy to find, among the debris of the jasper veins of Nova Scotia, for instance, abundance of ready-made arrow-heads and other weapons; and there is every reason to believe that the Indians, and perhaps the aboriginal Celts also, sought for and found those naturally split stones which gave them the least trouble in the manufacture, just as they selected beach pebbles of suitable forms for anchors, pestles and hammers, and hard slates with oblique joints for knives. To these

natural forms, however, the savage usually adds a little polishing, notching, or other adaptation; and this seems to be wanting in the greater part of the specimens from Abbeville.

2. Nothing is more difficult, especially in an uneven country, than to ascertain the extent to which old gravels have been re-arranged by earthquake waves or land floods. Nor does the occurrence in them of bones of extinct animals prove anything, since these are shifted with the gravel. Very careful and detailed observations of the locality would be required to attain any certainty on this point.

3. The places in which gravel pits are dug, are often just those to which the aborigines are likely to have resorted for their supply of flint weapons. They may have burrowed in the gravel for that purpose, and their pits may have been subsequently filled up. Farther, savages generally make their implements as near as possible to the places where they procure the raw material; and in making flint weapons, where the material abounds, they reject without scruple all except those that are most easily worked into form. If of human origin at all, the so-called weapons of Abbeville are more like such rejectamenta than perfected implements. This would also account for the quantity found, which would otherwise seem to be inconsistent with the supposition of human workmanship.

4. The circumstance that no bones or other remains referable to man have been found with the flint articles, is more in accordance with the suppositions stated above, than with that of their human origin, in any other way than as the rejectamenta of an ancient manufacture.

5. From a summary of the facts given by Sir Charles Lyell at the late meeting of the British Association (1859), as the result of personal investigations, it appears that the gravels in question are *fluviatile* and dependent on the present valley of the Somme, though still apparently of very great antiquity. This places the subject in an entirely different position from that in which it was left by Perthes and Prestwick. River gravels are often composed of older debris, re-assorted in a comparatively short time, and containing tertiary remains intermixed with those that are modern; and it is usually quite impossible to determine their age with certainty. Farther, if we may judge from American rivers, those of France must, when the country was covered with forest, have been much larger than at present; and at the same time their annual freshets must have been smaller, so that nothing is more natural than that remains of the savage aborigines should be found in beds now far removed from the action of the rivers. When to this we add the occurrence at intervals of great river inundations, we cannot, without a series of investigations bearing on the effects of all these changes, allow any great antiquity to be

claimed for such deposits. The subject is, in short, in such a condition at present, that nothing can with safety be affirmed with respect to it.

I may add, that Sir Charles Lyell, while admitting the apparent contemporaneous association of human remains with those of extinct animals of the Tertiary period at Brixham, rejects as modern the so-called fossil men of Denise in central France, which had been associated with the Abbeville discoveries.

FINIS

INDEX.

PAGE

Abraham, ... 313
"Accommodation," theory of 44
Agassiz on Species, ... 281
" on Prophetic Types, ... 348
Animals, Lower, Creation of 187
" Higher, Creation of 206
Ansted on Mesozoic Fauna, ... 198
" on Tertiary Fauna, ... 210
Antediluvians, ... 236
Antiquity of the Earth, ... 325
" of Man, ... 299, 308
Aretz, ... 67, 72, 148
Astronomy of the Hebrews, ... 183
Atmosphere, constitution of 130
" creation of 133
Augustine on creative days, ... 106
Azoic rocks, ... 167, 367

Bara, ... 61
Babel, ... 241
Bachman on hybridity, ... 260
Beginning, ... 339, 68
Bede on creative days, ... 106
Beaumont, De, on continents, ... 158
Behemoth, ... 209
Bhemah, ... 206
Birds, creation of 193
Bronn on origin of species, ... 334
Brachykephalic skulls, ... 269
Bunsen's chronology, ... 303

Carnivora, creation of 208
Carpenter on varieties of man,..... 271
Centres of Creation,..... 390
Chaos,.....71, 79
Cosmogony, Hebrew, its objects, ... 17
" " its character,..... 26
" " its authority, ... 30
" of Egypt,.....79, 122
" of Phenicia, ...79, 80
" of Greece,..... 80
" of India, ...81, 123
" of Persia, ... 122
Colour of races of men, ...266, 277
Cranial characters in man, ... 269
Creation,..... 61
Cuvier on species,..... 249

Days of creation,..... 98
1st,..... 86
2d, ... 130
3d, ... 143
4th,..... 175
5th,..... 187
6th,..... 206
7th,..... 232
Prophetic,..... 127
Dana on creation, ... 118
" on creation of plants,..... 172
" on Tertiary Fauna, ... 212
Darwin on species, ... 252
" on Niata cattle, ... 256
Development in nature, ...52, 370
Deep, ... 75
Deshé,..... 160
Deluge, ... 238
De Candolle on species,..... 249
Design in nature, ... 54
Diodorus Siculus on Egypt,..... 79
Dolicho-kephalic crania, ... 270

Earth, ... 66, 72
" its foundations, ... 148
Ecclesiastes 1st, ... 51
Eden, conditions of..... 217
" site of..... 235
Egypt, Early History of..... 302
Elohim,..... 69, 363
Exodus xxiv. 10, ... 137
Final causes, ... 354
Firmament,..... 130
Foundations of the Earth,..... 45, 148
Fluidity, original, of the Earth,..... 365

Genesis i. 1, ... 60
" i. 3, ... 86
" i. 5, ... 98
" i. 6, ... 130
" i. 10, ... 147
" i. 11, ... 160
" i. 15, ... 175
" i. 20, ... 187
" i. 24, ... 206
" i. 26, ... 214
" ii. 163, 232
" iv. 23,..... 27
Geology, principles of 319
Gliddon on races of men,..... 264
Gosse on prochronism,..... 203
" Grass," in Gen. i., ... 160

Hair of races of man, ... 267
Hamite races,..... 311
Harmony of revelation and science,..... 339
Heavens, ... 64, 140, 175
Herbivora, creation of 206
Hitchcock on creative days,..... 114
Hopkins on Crust of the Globe, ... 304
Horner on Alluvium of Nile,..... 304
Hunt on chemistry of Incandescent Globe, ... 366

Humboldt on Hebrew poetry, ... 21
Hybridity, laws of..... 260
" in man, ... 274

Incandescence of the Earth 134

Japhetite races, ... 310
Jehovah,.....69, 363
Jones, Sir Wm., on Indian cosmogony,..... 123
Job 9, 5, ... 150
9, 9, ... 182
28, ... 152
28, 26,..... 50
36, 37,..... 142
38, ...50, 141, 150
38, 12,..... 97
38, 31,..... 182
38, 33,..... 50

Kurtz on days of vision, ... 128

Latham on languages of Africa, ...295, 278
" on radiation of languages, ... 296
Lamech, his poem, ... 27
Laws of nature,..... 50
La Place, nebular hypothesis,..... 89
Land, its creation, ... 147
" geological history of 157
Languages, unity of..... 391
Leviticus 11th, ... 188
Light,..... 86
Logan on Azoic Rocks,..... 367
Luminaries,..... 175
Lyell on origin of species, ...332, 370

Mammals, creation of..... 206
Manetho, chronology of..... 303
Man, creation of..... 214
Menes, his epoch, ... 302

Mesozoic period, ... 195
Miller on creative days, ... 107
" on creation of plants, ... 167
" on origin of species, ... 331
Morton on species, ... 249
Murchison on Azoic Rocks, ... 367
Mythology as related to the Bible, ... 394

Negro races, ... 278
Nimrod, ... 241

Origen on creative days, ... 106

Pentateuch, its authenticity and genuineness, ... 361
Periods, creative 98
Persians, cosmogony of 122
Philology, its evidence on Unity of Man, ... 294
Pierce on forms of Continents, ... 158
Pictet on origin of species, ... 330, 372
Pickering, classification of Man, ... 266
Plants, creation of 160
Powell on Genesis, ... 39
Progress in nature, ... 52, 342
Prochronism, ... 203
Proverbs 8, ... 51, 68, 149
" 19, ... 76
Psalms 8, ... 184
" 8, 1, ... 66
" 8, 28, ... 51
" 18, ... 151
" 19, ... 185
" 90, 1, ... 104
" 104, ... 139, 148, 204
" 119, 90, ... 51
" 119, 20, ... 149
" 139, ... 58
" 148, 6, ... 50
" 147, ... 184

Rakiah, ... 136
Reptiles, ... 190
Remes, ... 192, 206
Reconciliation of Scripture and Geology, ... 316

Shamayim, ... 64
Shemite races, ... 311
Sheretz, ... 187
Spirit of God, agency of, in creation, ... 78
Species, in Genesis 1st, ... 163
" nature of 248
" unity of origin of 280
" creation of 370
Stereoma, ... 136
Spheres, Celestial, doctrine of 46

Table of Geological chronology, ... 323
" of Biblical cosmogony, ... 350
Tannin, ... 189, 388
Tennyson on types in nature, ... 201
Type in nature, ... 56
Types of mankind, ... 35

Unity of man, ... 261
Unity of nature, ... 345

Varieties, laws of 253
Veda, its cosmogony, ... 81
Vegetation, creation of 160

Wallace on species, ... 252
Whales, great, of Gen. 1, ... 189
Wilson on American crania, ... 270